

Kew Bulletin

PUBLISHED FOR THE ROYAL BOTANIC GARDENS, KEW
FORMERLY THE "BULLETIN OF MISCELLANEOUS INFORMATION"

No. 4, 1953

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA:

LVI.* FURTHER STUDIES IN BIGNONIACEAE.

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The following notes and descriptions of new taxa have been prepared over a number of years during which I have received large quantities of material from many correspondents and institutions. Of particular interest have been the large consignments of specimens collected in Colombia and sent from the Herbario Nacional Colombiano, Bogotá, through the kind mediation of Dr. A. Dugand, who is himself a keen and able student of this family ; on the Guayana Highlands, by members and friends of the staffs of the herbaria of the New York Botanical Garden and the Chicago Natural History Museum ; and in Amazonian Brazil, by members of the Instituto Agrônômico do Norte, Belém, Pará. Through the kindness of Dr. George Taylor, I was able to see the *Bignoniaceae* collected by Dr. W. R. Philipson on his expedition to the Sierra de la Macarena, Colombia, and by Miss W. M. A. Brooke in Bolivia ; while some of those collected in Ecuador by Dr. W. H. Camp were sent to me from New York. Argentine institutions, especially the Instituto Lillo, have been most active in sending large series of specimens gathered in their country. Prof. R. E. D. Baker, of the Imperial College of Tropical Agriculture, has most thoroughly investigated the representation of this family in Trinidad and Tobago, while I was preparing my account for the flora of which he is now editor. Several other botanists have sent me valuable small consignments of specimens from their institutions or private collections, and among these I must mention Dr. J. Lanjouw, of Utrecht ; Dr. A. Lemée, of Rennes ; Dr. Léon Croizat, of Caracas ; Dr. P. Raulino Reitz, of the Herbario Barbosa Rodrigues, Santa Catarina ; Dr. A. Brandão Joly, of the Universidade de São Paulo ; Dr. Amaro Macêdo, of the Instituto Marden, Ituiutaba, Minas Gerais ; Father B. Rambo, S.J., of the Colégio Anchieta, Porto Alegre, Rio Grande do Sul ; and Dr. Umberto Fabris, of Ciudad Eva Perón.

Loans from the Paris Herbarium, from the Herbarium of the British Museum (Natural History), and the Herbaria of Brussels, Florence, Munich and Chicago, have been of the greatest assistance, as has the large

* Continued from K.B., 1952, p. 306.

series of phototypes which Kew has now purchased from the Chicago Natural History Museum.

I wish to thank all these individuals and institutions for their help, and, in particular, the following botanists for special services rendered, without which I could not have completed these notes : Dr. Richard S. Cowan, Dr. A. Dugand, Prof. G. Erdtman, Prof. H. Humbert, Dr. Alicia Lourteig, Prof. Rodolfo Pichi-Sermolli, Dr. Lyman B. Smith and Dr. Julian Steyermark.

My reports on *Bignoniaceae* from the Guayana Highlands are to be published elsewhere. In the following notes, the genera are arranged in systematic, the species in alphabetical, order. Unless otherwise stated, the specimens cited are in the Kew Herbarium.

For the convenience of other students of *Bignoniaceae*, I ought, I think, to refer to my previous papers and notes on this family. They appeared as follows : *Kew Bull.* **1930**, 210-215 ; **1932**, 18-29 (with T. A. Sprague) ; **1932**, 81-93 (with T. A. Sprague) ; **1934**, 101-104, and 222-223 (with T. A. Sprague) ; **1940**, 302-304 ; **1946**, 87-88 : *Rec. Trav. Bot. Néerl.* **34**, 205-232 (June 1937) : *Candollea*, **7**, 244-254 (June 1937) : *Pulle, Fl. Suriname*, **4**, pt. **2**, 1-86 (1938) : *Brittonia*, **3**, 91-94 (1938) : *Lilloa*, **3**, 457-465 (1938) ; **14**, 133-137 (1948) : *Lloydia*, **2**, 209-213 (1939) : *Journ. Arnold Arb.* **28**, 430-434 (1947), with E. D. Merrill : *Bull. Torrey Club*, **75**, 662-667 (1948) : *Bot. Mag.* **165**, new ser. t. 23 (1948).

Tabebuia floccosa (Klotzsch ex Bur. et K. Schum.) Sprague et Sandwith in *Kew Bull.* **1932**, 27.

The holotype specimen of this species, *Richard Schomburgk* 334, was presumably destroyed in the Berlin Herbarium during the War. I know of the existence of no duplicate, but a photograph of the type specimen is in the Kew Herbarium. This specimen was remarkable and isolated as a species of *Tabebuia* and some years ago I realised how closely it resembled Trinidad material of *Saldanhaea seemanniana* Kze., a species which I am transferring to the genus *Xylophragma* (see p. 469). Careful examination of the photograph and of all the described characters of *T. floccosa* has now convinced me that the type specimen of this species was, indeed, conspecific with *S. seemanniana*, of which it represented a form with the inflorescence reduced to a single flower with an unusually long calyx and calyx teeth. It is significant that Sprague and Sandwith (l.c. 28) described the ovary as bearing 6-8 rows of ovules in each loculus : 8 rows of ovules in each loculus of the ovoid ovary is a characteristic of *Saldanhaea seemanniana*. The unusual floccose indumentum, composed of branched "dendroid" hairs, and the venation of the three leaflets, also seem unmistakable. If this identification is accepted, *Tabebuia floccosa* becomes a synonym of *Xylophragma seemanniana*, which extends from Mexico to Venezuela and Trinidad, this being the first record from British Guiana.

Tabebuia heteropoda (DC.) Sandwith, comb. nov.—*Tecoma heteropoda* DC. Prodr. **9**, 219 (1845) ; Bur. et K. Schum. in Mart. Fl. Bras. **8**, pars 2, 333 (1897).

PERU. Ruiz and Pavón (Herb. Paris. (type). Herb. Deless., Geneva. Herb. Barbey-Boissier, Geneva. Kew Herb.).

The inflorescence is separate from the rest of the material, both on the type sheet at Paris, and on a duplicate sheet (*Pavón* ex Hb. Moricand) in the Herbarium Delessert at the Conservatoire Botanique, Geneva. The calyx is lepidote, and one wonders if these inflorescences should really be associated with the branchlets and foliage, with their very distinct and abundant tomentum of branched hairs. No inflorescences are present on the two sheets at Kew. It is hoped that further Peruvian collections will throw more light on this species.

Tabebuia palustris Hemsl. Biol. Centr. Amer., Bot. 2, 495 (1882).

COLOMBIA. Pacific Coast, Dept. Choco : Cupica, "en playa inundada," shrub 2-3 m., fls. white, June 1950, A. Fernandez 359 (Herb. Nac. Colombiano ; Kew Herb.).

Apparently the first record for Colombia of a rarely collected species, known to me previously only from the type collection at the Rio Grande Swamps, Panama Canal Zone.

Tabebuia pentaphylla (L.) Hemsl. Biol. Centr. Amer., Bot. 2, 495 (1882).—*Bignonia pentaphylla* L. Sp. Pl. ed. 2, 870 (1763). *Tecoma pentaphylla* (L.) DC. Prodr. 9, 217 (1845).

This name has been widely misapplied, but its correct application, as Mr. J. E. Dandy has convinced me, is clear. *Bignonia pentaphylla* L. is, in fact, an illegitimate name for a Jamaican species. Its diagnostic phrase is based on the *Bignonia foliis digitatis* of Hortus Cliffortianus p. 497, but so is the diagnostic phrase of the earlier *Bignonia leucoxydon* L. Sp. Pl. ed. 1, 624. Mr. Dandy has examined the type specimen of the latter in Linnaeus' Herbarium and has verified it as representing the "White Wood" of Jamaica. There is no specimen in the Clifford Herbarium at the British Museum. Subsequently, in the second edition of the Species Plantarum, Linnaeus divided his original *B. leucoxydon* into two species : a *B. pentaphylla*, whose diagnostic phrase (emended) was still based on Hort. Cliff. 497, while it retained the citations from Plumier, Catesby, Sloane and Ray, and the habitat "in Jamaica, Caribaeis, agris humidioribus et ad ripas" ; and a *B. leucoxydon*, with a new and original diagnosis based on no reference, the citation from Plukenet and an additional one from Miller, and the habitat "in America". According to the International Code, *B. pentaphylla* L. must be regarded as an illegitimate substitution for the original *B. leucoxydon* L., while the second *B. leucoxydon* L. (whatever its botanical interpretation may be) must be treated as a later homonym.

When De Candolle made the combination *Tecoma pentaphylla* and compiled his description for the Prodrômus, he applied Linnaeus' name to the species which is so frequent in the Lesser Antilles and is commonly known as "Poirier blanc" or "White Cedar" ; and this interpretation has been accepted by Grisebach and Urban. But this species, which is usually known as *Tabebuia pallida* Miers or, more recently, as *T. heterophylla* (DC.) Britton subsp. *pallida* (Miers) Stehlé, seems to be wholly distinct from the Jamaican "White Wood", although Britton and Wilson, and Stehlé, have treated them as conspecific. Urban, it may be noted,

referred the Jamaican "White Wood" to the tree now known as *Tabebuia heterophylla* subsp. *genuina* Stehlé, but here again we must differ. Meanwhile, the correct name for this "White Wood", even when regarded as an endemic species of Jamaica, is a subject for investigation. Unfortunately, the epithet *leucoxylon* cannot be used for it, owing to the existence of the combination *Tabebuia leucoxyla* (Vell.) DC., based on *Bignonia leucoxyla* Vell., a Brazilian species.

Linnaeus' *Bignonia pentaphylla* was also incorrectly identified by Seemann and by Hemsley, this time with a well-known and wide-spread *Tabebuia* of the mainland of Central and South America, from Mexico to Venezuela and Ecuador. This is a deciduous tree, commonly cultivated in tropical gardens on account of its splendid, many-flowered thyrses of pinkish-purple flowers, and further characterised by its 5-foliolate leaves with more or less coriaceous, elliptic or elliptic-ovate, usually conspicuously acuminate, densely lepidote leaflets, which vary much in size and may be as large as 25 cm. long and 12.5 cm. broad, and by its large beaked-acuminate capsules 25–35 cm. long when mature. In Trinidad this species is a familiar cultivated tree and is known as "Pink Poui". It is also an important commercial timber tree in parts of Mexico and Central America. The identification of this species with *Tabebuia pentaphylla* (L.) Hemsl. caught on, and has persisted to the present day in the recent papers of Standley and Seibert; while, in the Flora Brasiliensis, Bureau and Schumann had treated *Bignonia pentaphylla* L. as a var. *pentaphylla* Bur. et K. Schum. of a widely variable *Tecoma leucoxylon* (L.) Mart. ex DC., this variety being said to occur in the Antilles, and in Panama and Venezuela, thus covering part of the area of the tree we are discussing. This tree has evidently been confused by some authors (e.g., Bureau and Schumann, Britton and Wilson, Urban), who were accepting De Candolle's interpretation of *Bignonia pentaphylla* L., with the West Indian "White Cedar", *Tabebuia pallida* Miers, which is also known in cultivation, but *T. pallida* differs widely in its leaves being often 1–3-foliolate, the leaflets obtuse at the apex, of thinner texture with less prominent nerves beneath, the much less showy thyrses with fewer flowers, and the shorter capsule (up to 20 cm. long, commonly much shorter).

Since, as should now be clear, the combination *Tabebuia pentaphylla* (L.) Hemsl. cannot be used for this tree of the mainland, we must give it the next available legitimate name, which appears to be ***Tabebuia rosea*** (Bertol.) DC. Prodr. 9, 215 (1845), based on *Tecoma rosea* Bertol. Fl. Guatimalensis, 25 (1840). There is no doubt whatever of the identity of Bertoloni's species with this taxon. By the kindness of Prof. R. Pichi-Sermolli, of Florence, I have recently been able to examine Bertoloni's type material, which was collected at Escuintla, Guatemala, and was given to him in 1837 by J. Velasquez, a member of the Mexican legation to the Holy See. The material consists of loose leaflets and flowers, and an immature capsule 18 cm. long, corresponding to Bertoloni's description of *Tecoma rosea* and agreeing in all respects with the well-known *Tabebuia* which has so often been called *T. pentaphylla*.

Tecoma arequipensis (Sprague) Sandwith, comb. nov.—*Stenolobium arequipense* Sprague in Engl. Bot. Jahrb. 42, 177 (1909).

PERU. Frequently collected in the neighbourhood of Arequipa. In addition to the type collections, I have seen the following : *Sandeman* 3750, *Stafford* D.43, *Hinkley* 31 (distributed as *T. garrocha* Hieron.).

Tecoma cochabambensis (*Herzog*) *Sandwith*, comb. nov.—*Stenolobium cochabambense* *Herzog* in *Meded. Herb. Leid.* no. **29**, 42 (1916).

BOLIVIA. Departments of Cochabamba and Santa Cruz.

Tecoma tanaeciiflora (*Kränzln.*) *Sandwith*, comb. nov.—*Stenolobium tanaeciiflorum* *Kränzln.* in *Engl. Bot. Jahrb.* **54**, Beibl. 119, 22 (1916).

PERU. Dept. Arequipa. *Stafford* 1174 (below Chuquibamba, near type locality) and 1145 (Quebrada Molle, N. of Arequipa) agree with *Kränzln's* description of this species, allowing for the fact that both pinnate and simple leaves are found on the same branchlets. The existence of a form with pinnate leaves was noted in the field by *Weberbauer* when he collected the type, and was mentioned by *Kränzln* in the remarks following his description. The pinnate leaves bear 3–7 leaflets. Some of the simple leaves are much larger than those described by *Kränzln*, the lamina being up to 7 cm. long and 3 cm. broad. It is clear that the taxonomy of the Peruvian and Bolivian species of *Tecoma* can only be understood after intensive field-studies.

Zeyheria digitalis (*Vell.*) *L. B. Smith et Sandwith*, comb. nov.—*Bignonia digitalis* *Vell.* text p. 251 (1825), ill. **6**, t. 47 (1827). *Zeyheria montana* *Mart. Nov. Gen. et Sp. Pl. Bras.* **2**, 65, t. 159 (1826) ; *Bur et K. Schum.* in *Mart. Fl. Bras.* **8**, pars 2, 353 (1897), cum syn. al.

Dr. Lyman B. Smith, of the United States National Herbarium, kindly drew my attention to the probable necessity for making the above new combination for the well-known Brazilian shrub, *Zeyheria montana*. The change, in my opinion, is unavoidable, and I therefore wish to associate *Dr. Smith's* name with it.

Jacaranda acutifolia *H. et B.*, *Pl. Aequinox.* **1**, 59, t. 17 (1805) ; *H.B.K.*, *Nov. Gen. et Sp. Pl.* **3**, 145 (1819) ; *DC. Prodr.* **9**, 229 (1845) ; *K. Schum.* in *Engl. et Prantl, Pflanzenfam.* **4**, 3 B, 234 (1894) ; *Bur. et K. Schum.* in *Mart. Fl. Bras.* **8**, pars 2, 391 (1897), partim.

I have recently had the privilege of examining the type material of this species (in the Paris Herbarium) which was collected by *Humboldt* and *Bonpland* in northern Peru, at San Felipe, by the Rio Huancabamba. The following specimens agree, in my opinion, with this material : Huánuco, *Dombey* (*Herb. Paris.*, material cited by *De Candolle* as collected at "Huacano") ; Huánuco, frequent at 6500 ft., fl. Nov. 1942, *C. Sandeman* 3495 ; Rio Huallaga, fruits only, comm. 1880, *Nation* ; valley of Lima, cultivated as a medicinal plant, *Mathews* 395.

J. acutifolia was united by *Bureau* and *Schumann* in the *Flora Brasiliensis* with *J. mimosifolia* *D. Don*, a species of N.W. Argentina which is commonly cultivated and well-known as a beautiful, decorative tree in warm temperate and tropical regions of both Worlds. *Dr. Sprague* and I have not accepted this identification which, indeed, would be rather unlikely, if only on phytogeographical grounds. The above-mentioned Peruvian

material of *J. acutifolia* differs from the Argentine and cultivated *Jacaranda* in its leaves which bear only 6–12 pinnae ; in the leaflets which, when dried, lack a distinct reticulation of impressed nerves and veinlets on the upper surface ; in the longer calyx which, including the teeth, is 2.5–3.5 mm. long, with teeth 0.5–2 mm. long ; and in the smaller ripe capsule, which is only 2.5–4 cm. broad. The Argentine and cultivated *Jacaranda* has leaves which, except the uppermost, bear more than 12 pinnae ; leaflets with a clearly marked reticulation of impressed nerves and veinlets on the upper surface when dried ; calyx usually shorter and, including the teeth, up to 2.5 mm. long, the teeth often less than 1 mm. long ; and the ripe capsule 4.5–6 cm. broad.

The fruits of *J. acutifolia* are shortly and obtusely cuspidate at the apex in all the examples seen, as well as in Humboldt and Bonpland's plate. Those of the cultivated *Jacaranda* seem to be normally rounded at the apex, but an example with a short obtuse cusp has been figured in *Genera et Species Plantarum Argentinae*, 2, t. CLXIX (1944). I regard the longitudinal central furrow of Humboldt and Bonpland's capsule as a phenomenon of individual development rather than as a character of any taxonomic significance : it is not evident in Nation's fruits, which agree in other respects. There seems to be little if any difference between the seeds of the two species. Those of the cultivated tree are 1.4–1.6 cm. long and 2–2.3 cm. broad in the examples seen ; those of Nation's fruits of *J. acutifolia* are equally broad, but shorter and up to 1.1 cm. long, while they are figured (natural size ?) by Humboldt and Bonpland as nearly 1.5 cm. long.

Humboldt and Bonpland described the 5 calyx teeth of *J. acutifolia* as equal, a statement not borne out by their type specimen, although the teeth of several of the calyces do look more or less equal. Again, they described the capsule as 1 inch, or 2 cm., broad : that is clearly an error, since the fruit figured on their plate measures 6×4 cm., while the solitary fruit with the type material is 5×3.5 cm.

Dr. Sprague and I convinced ourselves long ago that the common cultivated *Jacaranda*, which is a native of N.W. Argentina, is to be identified with *J. mimosifolia* D. Don in *Bot. Reg.* t. 631 (June 1st, 1822). Don's plant was a form with pubescent calyx and leaves, such as can be matched with several native gatherings in Argentina. The synonymy of this species is unusual. *Jacaranda ovalifolia* R. Br. in *Bot. Mag.* t. 2327 (June 1st, 1822) was published on the very same day, and not only is conspecific but was actually described and figured from material derived from the same source, the botanic garden of the Comte and Comtesse de Vandes, at Bayswater. The specific epithet chosen by the first author who combined the two species must therefore be adopted, and this is *mimosifolia*, since Don reduced Brown's *J. ovalifolia* to his own species in the following year, in *Edinb. Phil. Journ.* 9, 266 (1823). The origin of the tree cultivated at Bayswater was not certain ; it was supposed to have come from "the Brazils, and to have been introduced within these three years", but Don added, "But we know no good authority for the last statement". Robert Brown's species was merely said to be a native of tropical South America.

On account of its beauty, its nativity and the resemblance of the interior of the corolla (with its posterior white stripe) to the Argentine

national flag, *J. mimosifolia* was considered by the Committee which met to choose the national flower of Argentina. Eventually, however, *Erythrina crista-galli* was given that honour.

Jacaranda caucana Pittier in Contr. U.S. Nat. Herb. **18**, 258 (1917).—*J. trianae* Kränzl. in Fedde Rep. Spp. Nov. **17**, 226 (1921).

I have recently examined fragments from the type material of this species (Pittier 925, from Cali, Cauca, Colombia) which were generously presented by the United States National Herbarium. They show that Pittier's description was faulty or unsatisfactory in at least two important respects. The calyx is distinctly 5-lobed (rather than "5-toothed"), while the corolla tube is conspicuously glandtipped-pilose outside in the lower portion, especially on the narrow constricted part and also below it, on the swollen portion surrounding the ovary (not "glabrous without except for sparse white hairs near the apex"). These two characters, in my opinion, are more significant than those given by Pittier himself for the differentiation of this species from *J. lasiogyne* Bur. et K. Schum., which was described from material collected on the llanos of the Rio Meta, and also serve to separate it from the allies of *J. lasiogyne*, viz., *J. obtusifolia* H.B.K. and *J. rhombifolia* G. F. W. Mey., which occur on similar llanos farther east (see my next note).

Specimens of *Jacaranda* with these characters (although the development of the calyx lobes is quite variable, even on the same collection, and they become reflexed and easily broken off), as well as with the tomentose ovary, have been collected over a wide area in western Pacific Colombia (Dept. of El Valle), in the Cauca Valley, in the Depts. of Tolima and Antioquia, at La Mesa near Bogotá, and at Ocana; also in Venezuela (Valencia, Carabobo, Pittier 8790; garden, Caracas, Pittier 9541), in Panama (Veraguas, Seemann 1127; Paraiso Sta., Sutton Hayes) and in Costa Rica (Tonduz 7102, ed. Donn. Sm., distributed as *J. filicifolia* D. Don). Pittier noted that his *J. caucana* was known locally as "Gualandai", and stated that his type tree was cultivated in a garden although the same tree "was said to grow wild in the district surrounding Cali." But Pittier proceeded to assume that the "Gualanday" of Cundinamarca and Magdalena was a different species, because Cortés in his Flora de Colombia, p. 99, had given it the illegitimate name *Jacaranda gualanday*, with the well-known name *J. mimosifolia* D. Don as a synonym; whereas the evidence of specimens of "Gualanday" from this region (see Goudot's collection at Ibagué, and a Triana collection, no. 4115, from the province of Tequendama) goes to show that, in fact, the tree known there by this name is *J. caucana*.

From the evidence of the description, and of a photograph of what is apparently part of the type collection, viz., *Triana* from La Mesa, Bogotá, 1200 m., in the Conservatoire Herbarium at Geneva, it is obvious that *Jacaranda trianae* Kränzl. is synonymous with *J. caucana* Pittier as interpreted by me. On this Geneva sheet Schumann has written, "*J. lasiogyne* B. et Sch.", and the photograph has been distributed by the Chicago Natural History Museum as representing that species. However, not merely is it neither the type specimen nor part of the type collection of *J. lasiogyne*, which was collected by Karsten, but also it fails to agree with the description of that species in the Flora Brasiliensis.

It must be pointed out that the leaves of *J. caucana* vary very considerably, both in the number of pinnae and the number of pairs of leaflets on each pinna, and the leaflets may be strongly hairy or nearly glabrous except for hairs along the midrib towards the base of the lower surface. Sutton Hayes wrote that the leaves from "young and thrifty shoots growing from the body of the tree . . . are much larger than those growing from the old wood" of the same tree. This remark applies also, no doubt, to the development of the inflorescence. The fruits also vary in size, and capsules collected by Dr. J. Cuatrecasas in the Dept. of El Valle, Colombia, measure as much as nearly 20 cm. long and 8.8 cm. broad, dimensions greatly exceeding those of Pittier's description.

Jacaranda obtusifolia H. et B., Pl. Aequin. 1, 62, t. 18 (1805) ; Sandwith in Lilloa, 3, 464 (1938).—*J. lasiogyne* Bur. et K. Schum. in Mart. Fl. Bras. 8, pars 2, 385 (1897) ?

When I wrote my notes on the fragmentary type material in the Paris Herbarium, I omitted to examine the ovary to see whether it was glabrous or tomentose, a character not mentioned by Humboldt and Bonpland which I later realised would have a bearing on the interpretation of this species. At my request, Dr. R. S. Cowan, of the New York Botanical Garden, most kindly checked this point for me when he was recently studying in the Paris Herbarium. He finds that the ovary of the type of *J. obtusifolia* is tomentose with adpressed greyish-white hairs. Knowing this, I should now refer to it material from three collections with tomentose ovaries and with the other characters near enough, in my opinion, to the original description and plate. All of them come from the same phyto-geographic region in Venezuela and Colombia, and no doubt were collected from trees growing in a similar type of habitat. They are : *Sprague* 11, from Cabuyaro, Rio Meta, Colombia ; *Maguire et al.* 31622, and *Cowan and Wurdack* 31558, both from the Rio Ventuari region, Terr. Amazonas, Venezuela. Now it is noteworthy that *Sprague's* gathering was made less than 100 miles, as the crow flies, from the type locality of *Jacaranda lasiogyne*. The latter species was characterized especially by its tomentose ovary and its author, Schumann, admitted the possibility of its being conspecific with *J. obtusifolia*, which, as he said, could not be proved since he was unable to examine the Humboldt and Bonpland type material. Neither can I prove this, since I have never seen either the specimen or a photograph of the type of *J. lasiogyne*, so that I cannot estimate the value of the distinctions attributed to the capsule. I very strongly suspect, however, that *J. lasiogyne* is only a form of *J. obtusifolia* with glabrous leaflets. Nor, when I consider the range of variation in the shape, texture and indumentum of the leaflets of the evidently related species, *J. rhombifolia* G. F. W. Mey., a common tree with a similar habitat and distribution extending into Guiana, can I resist the obvious conclusion that *J. rhombifolia* must be reduced to *J. obtusifolia* since it can be separated from it only by the possession of a glabrous ovary. This being so, the typical form of *J. obtusifolia*, with tomentose ovary, should be styled var. *obtusifolia* ; while I propose the reduction of *J. rhombifolia* to varietal rank, as follows :

Jacaranda obtusifolia H.B.K. var. ***rhombifolia*** (G. F. W. Mey.) Sandwith, var. nov. ; a var. *obtusifolia* ovario glaberrimo differt.—

Jacaranda rhombifolia G. F. W. Mey., Fl. Esseq. 213 (1818) ; Sandwith in Pulle, Fl. Suriname, **4**, pt. 2, 77 (1938), cum syn. *J. filicifolia* D. Don et *J. filicifolia* var. *puberula* K. Schum.

Distr. Northern South America, Venezuela to Guiana.

Schlegelia albiflora Kuhlmann in An. Prim. Reun. Sul-Amer. Bot. 1938, **3**, 89 (1940) ; Ducke in Tropical Woods, no. **76**, 31 (1943).

This species, of which I have seen isotype material as well as two other gatherings, *Froes* 21436 and *Pires* 549, from the Rio Negro region, seems to me quite indistinguishable, except by its white corollas, from *S. scandens* (Briquet et Spruce) Sandw., which was collected in the same region. I regard it simply as a white-flowered form of *S. scandens*, which itself should probably be reduced to *S. violacea* (Aubl.) Griseb. One of the characters used by Ducke (l.c. supra), for distinguishing *S. albiflora* from *S. violacea* and *S. scandens*, proves to be quite worthless : the large plate-shaped glands can be seen at the base of the lower surface of the leaves of all three species.

Schlegelia organensis Kuhlmann in Rodriguesia, no. **20**, 7 (1946).

This species is doubtless conspecific with my *Schlegelia ramizii*, published in Kew Bull. **1930**, 211, the type locality of which is in precisely the same region of Brazil, near Rio de Janeiro. Dr. Kuhlmann evidently overlooked the description of *S. ramizii*.

Arrabidaea bracteolata (DC.) Sandwith in Rec. Trav. Bot. Néerl. **34**, 215 (1937).—*A.* (?) *bitermata* Huber in Bol. Mus. Pará, **4**, 607 (1906).

I have recently been able to examine a photograph of Huber's type specimen of *A. bitermata*, which was collected on the Rio Ucayali, in Amazonian Peru, and have no doubt of the identity of this species with *A. bracteolata*, as interpreted by me (loc. cit.).

This is a very unusual and distinct species, not only on account of the biternate leaves, which are not always to be seen on dried specimens since the uppermost leaves are often simply ternate. The other distinctive characters are the flaking corky covering of the branchlets, petioles and petiolules ; the sharply acuminate, seriate pseudostipules ; the long-attenuate thin leaflets with numerous main lateral nerves, and with plate-shaped glands scattered near the midrib on their lower surface ; the small, tomentellous calyx, usually marked with numerous longitudinal gland-fields (these are not always evident, and see Huber's description) ; and the narrowly funnelshaped corolla which appears to be white, marked or tinged with rose-lilac. There is a curious superficial resemblance to *Pachyptera kerere* (Aubl. emend. Splitg.) Sandw. The fruit has not yet been collected, so that the generic position of the species cannot be finally assessed. Recent collections examined by me are as follows :

COLOMBIA. Amazonas : Trapecio Amazónico, Loretoyacu River, c. 100 m., Sept.-Nov. 1944, R. E. Schultes 6126 (Kew Herb. ; Herb. Nac. Colombiano).

PERU. Loreto : Iquitos, Creek Itáya, c. 100 m., Feb. 6th, 1932, Ynes Mexia 6479. This was described as a common woody vine, climbing on

small trees along riverbanks, with corolla white tinged with lilac, used locally for lashings and known as "Huacchamosa" ("poor youth"). This collection was distributed as a new species of *Adenocalymma*, proposed by Dr. Standley, but the name has never been published.

Arrabidaea corallina (Jacq.) Sandwith, comb. nov.—*Bignonia corallina* Jacq. Fragmenta Bot. 37, t. 42, f. 1 (1800–1809); Knuth, Initia Fl. Venez., in Fedde, Rep., Beih. Band 43, 638 (1927).

The identity of this species, the original material of which was sent to Jacquin from Caracas, Venezuela, does not seem to have been considered since the time of its description. The Kew Herbarium has recently acquired from the Chicago Natural History Museum a photograph of a specimen from Jacquin's herbarium, now preserved in the Vienna Hofmuseum Herbarium. This photograph, taken in conjunction with the description and Jacquin's plate, convinces me that *Bignonia corallina* is the very distinct species of Northern Colombia and Venezuela which has been discussed by myself and Dr. Dugand under the name **Arrabidaea obliqua** (H.B.K.) Bur., see Candollea, 7, 245–6 (1937) and Caldasia, 3, 256–7 (1945). Synonyms of this species are *Bignonia dichotoma* Jacq., *B. glabrata* H.B.K., *B. villosa* "Vahl" sec. Spreng., *B. balbisiana* DC., *Arrabidaea spraguei* Pittier and *A. ovalifolia* Pittier; nor can I regard *Arrabidaea acuminata* (Johnston) Urb., of Margarita Is., Venezuela, with which I would identify H. H. Smith 2402 (*A. rhodantha* Bur. et K. Schum. var. *oxyphylla* Sprague ms.), of Colombia, and Pittier 8873, 10405 and 11881, from Venezuela, as more than a form or variety with more acuminate leaflets and more numerous long trichomes on various parts, particularly the petioles, petiolules and inflorescence. The capsule of *B. corallina* and the dried specimen with leaves and inflorescence were sent to Jacquin at different dates, under the same name "Bejuco de coral", and both appear on his plate. Each element, so far as I can see, agrees excellently with *Arrabidaea obliqua*. The only discrepancy is in the conspicuously 5-lobulate calyx shown on the plate, and described as "calyx campanulatus cum ore brevissimo & argute quinquedentato". However, in the photograph of Jacquin's specimen, the calyces are merely irregularly sinuate or minutely denticulate, as in *A. obliqua*. The specimen drawn by Jacquin agrees in botanical characters with that in the photograph, but it is not a faithful drawing since its inflorescence terminates a young leafy shoot whereas, in the photograph, the inflorescence is lateral, from the leafless old wood, as is so often seen in *A. obliqua*. All things considered, it seems to me necessary to make the new combination for Jacquin's species in *Arrabidaea*, reducing to it *A. obliqua* and its various synonyms.

Arrabidaea rubrinervis Miers in Proc. Roy. Hort. Soc. 3, 192 (1863).

This species was referred with doubt by Bureau and Schumann to *A. chica* (H. et B.) Verlot. The type (Weir 178) in the Kew Herbarium is, however, immediately identified with **A. subfastigiata** Bur. ex Bur. et K. Schum. in Mart. Fl. Bras. 8, pars 2, 70 (1896), and Miers' name therefore takes precedence. This was pointed out long ago by Dr. T. A. Sprague, when he described his new species *Arrabidaea weberbaueri*, see

Engl. Bot. Jahrb. **42**, 176, Obs. 2 (1908). The reduction of the name *Arrabidaea subfastigiata* Bur. et K. Schum. is fortunate, since it is illegitimate. It was first used by Bureau, as *nomen subnudum*, in Kjoeb. Vidensk. Meddels., **1893**, p. 99, and was given proper definition in the Flora Brasiliensis, where *Adenocalymma floribundum* DC. Prodr. **9**, 201 (1845) was placed in the synonymy. Bureau and Schumann deliberately did not make the new combination *Arrabidaea floribunda* for this plant since, as they stated in the synonymy, *Adenocalymma floribundum* DC. was not the same species as *Bignonia floribunda* H.B.K., which was also a species of *Arrabidaea*. They also omitted to make the combination *Arrabidaea floribunda* (H.B.K.) in the formal way required by our present Rules, although there was no obstacle to their doing so, and this combination was, in fact, only made in 1919, by Loesener. Owing to this omission, however, their name *Arrabidaea subfastigiata* must today be regarded as illegitimate at the time of its publication. This species was recently made the type of a new genus, *Blepharitheca*, by M. Pichon, the binomial adopted being *B. floribunda* (DC.) M. Pichon, see Bull. Soc. Bot. France, **92**, 224 (1945).

Arrabidaea selloi (Spreng.) Sandwith, comb. nov.—*Bignonia selloi* Spreng. Syst. Veg. **2**, 831 (1825). *B. dichotoma* Vell. Fl. Flum. descr. 248 (1825), Ic. **6**, t. 32 (1827). *Arrabidaea dichotoma* (Vell.) Bur. in Kjoeb. Vidensk. Meddel. ann. 1894, p. 9; Sandwith in Rec. Trav. Bot. Néerl. **34**, 230 (1937); Dugand in Caldasia, **3**, 257 (1945). *Arrabidaea corymbifera* ("Vahl") Bur. ex K. Schum. in Engl. Pflanzenfam. **4**, 3 B, 213 (1894) et in Mart. Fl. Bras. **8**, pars 2, 37 (1896) sed non *Bignonia corymbifera* Vahl, vide Sandwith, l.c.

In 1937 I pointed out that Vahl's *Bignonia corymbifera*, the type specimen of which was collected in Trinidad, has been wrongly identified with a species of *Arrabidaea* occurring commonly from Central Brazil to Northern Argentina. I therefore revived the combination *Arrabidaea dichotoma* (Vell.) Bur. for this plant, since the name *Arrabidaea corymbifera* (Vahl) Bur. ex K. Schum. could not be used for it. In doing so, I unfortunately overlooked the fact that the basic name *Bignonia dichotoma* Vell. was a later homonym of *Bignonia dichotoma* Jacq. Enum. Pl. Carib. 25 (1760), a name now placed in the synonymy of *Arrabidaea obliqua* (H.B.K.) Bur., see Dugand in Caldasia, l.c., pp. 256-257. Since another name, *Bignonia selloi* Spreng., was given to this plant in the same year, the epithet *selloi*, which is not preoccupied in *Arrabidaea*, must therefore be adopted instead of *dichotoma*, and the above new combination becomes necessary.

Arrabidaea trailii Sprague in Bull. Herb. Boiss. sér. 2, **6**, 372 (1906).

This very distinct species has recently been collected on a number of occasions in Amazonian Brazil, viz. in the State of Pará, Ducke in Herb. Jard. Bot. Rio 22692, Black 1898; in Amazonas, Ducke 1209, Ducke in Herb. Jard. Bot. Rio 35630; and in Terr. Guaporé, N. T. Silva 437. Some of these collections have been distributed under the name *Parafridericia obidensis* A. Sampaio, an apparently unpublished name of a new genus and species, of which Herb. Jard. Bot. Rio 22692, from Obidos, was to have been the type collection.

Arrabidaea weberbaueri *Sprague* in Engl. Bot. Jahrb. **42**, 175 (1908).

COLOMBIA. Meta : Carretera Villavicencio a Apiay, cerca del acropuerto de Apiay, fl. Sept. 3rd, 1941, *D. Fairchild* 1089 (Herb. Nac. Colombiano).

Distr. Amazonian Peru and probably Brazil.

First record for Colombia. A good match with the Weberbauer type collection at Kew. The leaflets of this Colombian specimen, being much older, have become largely glabrate on the upper surface. This species, in section *Paracarpaea* with 4-seriate ovules, is well marked by its indumentum, its very showy inflorescence, the narrowly tubular-campanulate calyx with ribs excurrent as conspicuous teeth, the rather small and narrow corolla, and the short, curved-divergent anther thecae (together forming a semicircle) separated by a conspicuously produced connective which is retuse at the apex.

Another recent collection of this species is *Klug* 4179, from Amazonian Peru ; while *Krukoff* 6878 and 8012, and *Guedes* 24, from Amazonian Brazil, are also referable here as a form with the leaflets more finely tomentose beneath so that the surface appears canescent with prominent veinlets.

Stenosiphanthus duckei *A. Samp.* in Bol. Mus. Nac. Rio de Janeiro, **12**, 89 (1936) is **Arrabidaea lauta** *Bur. et K. Schum.* in Mart. Fl. Bras. **8**, pars 2, 43 (1896). Santarem was the type locality of both species. I have compared Sampaio's description, also *Herb. Jard. Rio* 35623 (coll. *Ducke*, at Borba, Rio Madeira), which was distributed as *Stenosiphanthus duckei*, with Spruce's type collection of *Arrabidaea lauta*, and there can be no doubt of the identity. *Spruce* 890* at Kew, and Spruce sheets marked "Bignonia (2)" at Kew, Paris and the Herbar Boissier, Geneva, all collected in May 1850 at Santarem, are evidently part of the same gathering as the type, *Spruce* "716", formerly in the Berlin Herbarium, 890* being the correct field number of Spruce himself. The sheet in the Herbar Boissier is written up as *Arrabidaea lauta* in Schumann's handwriting. Dr. Sampaio admitted the affinity of *Arrabidaea*, on account of the simple tendril, the 3-pored pollen-grains, and the linear capsule, but gave no distinguishing characters. Presumably, he was influenced by the shape of the corolla and the exerted stamens, in creating a new genus for the Santarem plant.

A recent Brazilian collection of this interesting species is *G. A. Black* 47-1661, from Capoeira at Belterra, State of Pará, Oct. 13th, 1947 (Herb. Inst. Agron. do Norte, and Kew Herb.).

Lundia rubicunda *Miers* in Proc. Roy. Hort. Soc. **3**, 196 (1863) ; *Bur. et K. Schum.* in Mart. Fl. Bras. **8**, pars 2, 245 (1897) ; is certainly conspecific with **Lundia obliqua** *Sonder* in Linnaea, **22**, 561 (1849), and falls into the synonymy of that species. The possibility of this identity was suggested by Schumann, l.c., but he had not seen the type material of Miers' species (which is represented at Kew), so placed it "incertae sedis" at the end of the genus.

Petastoma whitei (*Rusby*) *Sandwith*, comb. nov.—*Anemopaegma whitei* *Rusby* in Mem. N.Y. Bot. Gard. **7**, 353 (1927).

BOLIVIA. Hauchi, head of Beni River, 1800 ft., fl. Aug., *O. E. White* 955 (isotype !). Dept. Santa Cruz : Bosque del Urubó, prov. Cercado, 450 m., fl. Sept., *Steinbach* 6389, distributed as *P. samydoides* (Cham.) Miers. Choretí, 2860 ft., fl. Sept., *Miss W. M. A. Brooke* 5639.

This is a very beautiful and distinct species, apparently most nearly allied to *P. discocalyx* Bur. et K. Schum., from which it differs in the larger, lobed, calyx which is not flattened and disk-like, and in the curious indumentum of gland-tipped trichomes which is conspicuous along the entire length of the outer side of the corolla. The ovules are 16 in each of the 2 rows of each loculus, and therefore more numerous than in *P. discocalyx*.

Even in the absence of fruit, which is still unknown to me, this species could hardly have been assigned to *Anemopaegma* by any serious student of the family. Rusby's description omits several important details. The leaflets are strongly pilose-pubescent beneath with spreading hairs along the midrib and (less so) the main nerves, while there is a dense indumentum of similar hairs on the young branchlets and all over the very young leaves. The axillary thyrses are showy, with very beautiful rose-violet flowers. The membranous calyx is loose, lobed and folded ; it is about 8-10 mm. long, and dries a very pale brown, especially in the upper half. Above all, the indumentum of the corolla, which has already been mentioned, is quite peculiar among species of this genus.

Cydistia heterophylla Seibert in Carnegie Inst. Wash. Publ. 522, p. 417, pl. 6 (1940).

A synonym of this very interesting and distinct species is *Bignonia lepidota* Seem. Bot. Herald 179 (1854), non *Bignonia lepidota* H.B.K., prior. This is proved by examination of Seemann's type and other cited collections in Herb. Mus. Brit. and Kew Herb. The distribution given by Seibert can now be extended as follows :

PANAMA CANAL ZONE. Isla de Iguana, *Seemann* 601 (type of *Bignonia lepidota* Seem., Herb. Mus. Brit., dupl. in Kew Herb.). Paraiso Sta., May 1861, *Sutton Hayes* 126 (Kew Herb.). Near Madden Dam, June 1939, *Alston* 8865 (Herb. Mus. Brit. and Kew Herb.). Without locality, *Cuming* 1262, ex parte (Kew Herb.) ; the rest of this gathering belongs to *Saldanhaea seemanniana* Kze., which was misidentified by Seemann, loc. cit., with *Bignonia dentata* DC., see my note below, on *Xylophragma seemanniana*.

Other collections at Kew, additional to those cited by Seibert, are :

MEXICO. Vera Cruz : woods near Vera Cruz, *Galeotti* 1019 (with label of *Linden*, 1938 coll., no. 219, on same sheet) ; *Fortuño*, Coatzacoalcos River, 1937, *Ll. Williams* 9257.

Mussatia Bur. ex Baill. Fruits of this interesting little genus, which I discussed at length in Rec. Trav. Bot. Néerl. 34, 216-219 (1937), have at last become known to me. There is in the Kew Herbarium a capsule, with seeds, of *Krukoff* 5080, from the Rio Jurua basin, Brazil, a gathering which I have associated with *M. priurei* (DC.) Bur. ex K. Schum., in spite of the rather small corollas ; while I have recently been able to examine another, also with seeds, from a collection made by *Dr. W. R. Philipson*, no. 2140, on the Sierra de la Macarena, Colombia, in Jan. 1950.

The latter material, the vegetative portions of which unquestionably belong to the genus *Mussatia* and can probably be referred to *M. hyacinthina* (Standl.) Sandw., is in the Herbarium of the British Museum.

These two examples, though very different from each other in size, are of the same general character and show that the fruit of *Mussatia* is a thick, woody, oblong capsule at least 5.5 cm. broad, with the valves flattened and parallel to the septum, their surface glabrous except for minute scales and either unevenly rugulose or roughly and conspicuously rugose-warty, but not in any sense tuberculate or echinate. The seeds are very distinctive because of their size, being 2.5–3.5 cm. long and at least 6 cm. broad, glabrous and wholly brown in colour except for the very narrow, pale, hyaline, membranous margin of the wings. The body of the seed tends to be paler in colour than the wings.

The fruit of *Mussatia* is thus very different from that of its supposed close ally, *Tynnanthus*, which is an elongate-linear capsule with smooth valves and small seeds. Even if no further light is thrown on the affinity of this genus, my former argument for maintaining it (*loc. cit.* 217) is greatly strengthened.

The two known capsules are very distinct from each other. That of Krukoff 5080 (*M. prieurei* ?) is obviously old. It is about 29 cm. long and 9 cm. broad, equally narrowed at each end, and the surface of the thick, woody valves is roughly and conspicuously rugose-warty. The seeds are up to 3.5 cm. long and nearly 8.5 cm. broad, with rather stiff wings which become thinly papery towards the narrow membranous margin. The much younger-looking fruit of Philipson 2140 (*M. hyacinthina* ?) is 17.5 cm. long and 5.5 cm. broad, broadly attenuate-acuminate at the apex, and the surface of the much thinner valves is shining and almost smooth, though obviously wavy-rugulose. Its seeds are up to 3 cm. long and nearly 8.5 cm. broad, with thinner body and wings. It is hoped that further fruits of this genus, correlated with flowering material, will soon be collected.

The pollen of *Mussatia* has recently been described by Pichon, see Bull. Soc. Bot. France, **92**, p. 229 (1945). It is of the same form as that of *Tynnanthus*, but the exine is described as fairly densely and uniformly reticulate, whereas the exine of the grains of *Tynnanthus* was described and figured by Urban as smooth.

Tynnanthus Miers. Following Schumann, I treat Miers' original spelling *Tynnanthus* as an orthographic error, the first part of the name having been derived from the Greek epithet *τῖνος*, "small". Schumann (Mart. Fl. Bras. **8**, pars 2, 191, obs. 3) has summarised the situation by which Bureau, in his revision of *Tynnanthus*, in *Adansonia*, **8**, 270–274, deliberately adopted for two species Miers' *nomina nuda* which had been published two years earlier than his own validly published specific names (with excellent descriptions, based on the same type numbers) under his generic name *Schizopsis* (see *Adansonia*, **5**, 371–381). Schumann himself (*loc. cit.*) has shown how unjust this seemed to him, while continuing to accept the Miers epithets, out of deference to his collaborator. This civilized behaviour on the part of a Frenchman and a German towards an Englishman, which resulted in the illegitimate establishment of two invalid names, can now be reversed, without

wounding any sensibilities, by another Englishman who feels compelled to adhere to the rules of the International Code of Botanical Nomenclature. The following name changes now seem to be necessary :

Tynnanthus panurensis (Bur.) Sandwith, comb. nov.—*Schizopsis panurensis* Bur. in *Adansonia*, **5**, 373 (1865). *Tynnanthus petiolatus* Miers in *Proc. Royal Hortic. Soc.* **3**, 193 (1863), nomen nudum ; Bur. in *Adansonia*, **8**, 273 (1868), cum syn. *Schizopsis panurensis* Bur. ; K. Schum. in *Engler et Prantl, Pflanzenfam.* **4**, 3 B, 221 (1894) ; Bur. et K. Schum. in *Mart. Fl. Bras.* **8**, pars 2, 192 (1896).

Tynnanthus polyanthus (Bur.) Sandwith, comb. nov.—*Schizopsis polyanthus* Bur. in *Adansonia*, **5**, 378 (1865). *Tynnanthus laxiflorus* Miers, l.c., nomen nudum ; Bur. l.c., **8**, 274, cum syn. *Schizopsis polyantha* Bur. ; K. Schum., l.c. ; Bur. et K. Schum., l.c. 193.

Tynnanthus elegans Miers, loc. cit.

Based on *Bignonia elegans* Cham. in *Linnaea*, **7**, 702 (1832), which was a later homonym of *B. elegans* Vell. There was apparently no other epithet available for use at this date, so Miers was at liberty to adopt the epithet *elegans* in the genus *Tynnanthus*, the binomial *Tynnanthus elegans* Miers being a new name dating from the place of its publication in 1863. I agree entirely with Schumann (l.c., 197, Obs. 2) in rejecting the name *Chasmia ochroleuca* Schott ex Spreng. It is clear that Sprengel treated this name as a synonym of *Bignonia candicans* Rich. It was thus never validly published. In the same way, as Schumann pointed out, it is impossible to establish the validity of a generic name *Chasmia* from the date of this invalid publication of the binomial *Chasmia ochroleuca* by Sprengel.

Chodanthus praepensis (Miers) Sandwith, comb. nov.—*Cydista praepensa* Miers in *Proc. Royal Hortic. Soc.* **3**, 190 (1863) ; Bur. et K. Schum. in *Mart. Fl. Bras.* **8**, pars 2, 248 (1897). *Adenocalymma splendens* Bur. et K. Schum., l.c. 115 (1896) ; Sprague in *Bull. Herb. Boiss.*, sér. 2, **5**, 81 (1905). *Adenocalymma glomeratum* Sprague, l.c. *Chodanthus splendens* (Bur. et K. Schum.) Hassl. in *Bull. Herb. Boiss.* sér. 2, **6**, 141 (1906). *Arrabidaea grandiflora* Hassl. in *Bull. Herb. Boiss.* **6**, App. 1, 26 (1898). *Chodanthus splendens* var. *grandiflora* (Hassl.) Hassl., l.c. (1906).

I have examined thoroughly the material of the type (Weir 95) of *Cydista praepensa* Miers in the Kew Herbarium and have no doubt in identifying it with the common, well-marked, species of S. Brazil, Paraguay and N.E. Argentina which has for many years been known as *Chodanthus splendens*. It is probable that Miers' species has not been critically examined since the day of its description. His epithet has priority, and the above new combination is inevitable until an earlier name is found. I cannot distinguish Sprague's *Adenocalymma glomeratum* from this species. The genus *Chodanthus* has a number of characteristics which have been noted by Urban and myself (see *Rec. Trav. Bot. Néerl.* **34**, 209) and, in addition, a sweet smell which lingers on the leaflets of dried specimens and can still be detected on those of the type material of *Cydista praepensa*. This smell is reminiscent of that found on the dried leaflets of certain species of *Anemopaegma*, and on the dried flowers of

species of *Jacaranda*. A second species of *Chodanthus*, *C. puberulus*, occurring far away in Mexico, was recently described by Seibert : this is not yet represented in the Kew Herbarium.

It is obvious, as Urban hinted, that *Chodanthus* is extremely closely allied to *Mansoa* DC., as extended by Bureau and Schumann, *C. praepensus* being extremely close to *M. difficilis* (Cham.) Bur. et K. Schum. The two genera, apart from sharing the more evident characteristics, even have the same number of rows of ovules and the same type of pollen. I should have no hesitation in uniting them, were it not for two difficulties. In the first place, since *M. truncata* Sprague must be rejected from this genus, I have seen no fruit of any species of *Mansoa*, but Schumann described the capsule of *M. difficilis* and used it for his generic description. The words "compressa, elongato-linearis", modified by "siliquiformis" (a word not used in the descriptions of the very compressed capsules of, e.g., *Arrabidaea* and *Petastoma*) might apply to the capsule of *Chodanthus*, and the description of the dehiscence and the filiform replum fits it well. But the colour ("purpureo-sanguinea") and the breadth (1.2–1.4 cm.) given by Schumann could apply to a capsule of *Chodanthus* only if very immature. And there is another difficulty about *Mansoa*. Its author, De Candolle, based his description mainly on *M. hirsuta* DC., a rare species with a peculiar indumentum and calyx, and with the few ovules in only 2 rows in each loculus, and the fruit unknown. Evidently, then, the type species of *Mansoa*, when re-collected with fruit, may prove to be generically distinct from *Mansoa* as understood by Schumann, and from *Chodanthus*. For the present, therefore, it is prudent to maintain *Chodanthus*, while claiming that it is apparently congeneric with the commonest species of *Mansoa* as treated in the *Flora Brasiliensis*. Its very evident affinity, also, with the garlic-smelling genus, *Pseudocalymma*, and with yet another segregate from *Adenocalymma*, viz. *Onohualcoa*, must always be emphasised as a subject for consideration when estimating the value of the presence or absence of gland-fields at the nodes, or of tubercles on the capsule, or the number of rows of ovules in the loculus, or the shape of pollen-grains, as criteria for distinguishing genera of this family.

Pseudocalymma alliaceum (Lam.) Sandwith in Rec. Trav. Bot. Néerl. **34**, 210 (1937) ; in Pulle, Fl. Suriname, **4**, pt. 2, 21 (1938).

Since I made the above combination and discussed the identity of this species, I have examined a large series of garlic-smelling material of this affinity, ranging from Mexico to Peru and Brazil, and have compared the numerous specimens with the Paris Herbarium type of *P. alliaceum*, which consists only of foliage. After repeated attempts to separate the material into independent species, I have reluctantly been forced to the conclusion that there is, in fact, only one very widely ranging species with infinite variability in the size, shape, texture and venation of its leaflets, and in the development of its inflorescence, but with fairly constant qualitative characters in the calyx, corolla and fruit. A step in the same direction had already been taken by Dr. R. J. Seibert, in his account of the *Bignoniaceae* of the Maya Area, in which he identified some of his Central American material with the Brazilian *Pseudocalymma laevigatum* (Bur. et K. Schum.) Sampaio et Kuhl., a species which I had pre-

vously reduced to *P. hymenaeum* (DC.) Sandw., see Candollea, **7**, 247 (1937). Dr. Seibert divided his local material of the genus into two closely allied species, *P. laevigatum* and *P. macrocarpum*, using distinguishing characters which I cannot accept as taxonomically valid. I would now go much further and would unite all the Central American material with the garlic-smelling West Indian and South American specimens which have been described as or referred to *P. alliaceum* (Lam.) mihi, *P. sagotii* (Bur. et K. Schum.) mihi, and *P. pachypus* (Bur. et K. Schum.) mihi. Furthermore, I cannot with any conviction separate the Rio de Janeiro *P. hymenaeum* (*P. laevigatum*), with which *P. pohliianum* (Bur. et K. Schum.) mihi is surely conspecific. When all these species are united, the name to be used is that with the oldest specific epithet, viz., *P. alliaceum*.

Within this taxon, much of the material, ranging from Mexico to Brazil, has a relatively small calyx much less than 1 cm. in length, but there is one easily recognizable variation with a much larger calyx, which seems to be worth distinguishing as a variety but which cannot, I believe, be separated constantly by any other character from the range of the rest of the material with small calyces. This being so, if we divide the taxon into two varieties based on the size of the calyx, it is not proven to which Lamarck's type of *P. alliaceum* belongs. Two other collections, both in the same sterile condition and probably from material of just the same age, agree certainly with Lamarck's type, viz., *Etienne*, ann. 1872, from French Guiana (Herb. Paris.), and *Lanjouw and Lindeman* 430, ann. 1948, from Surinam (Utrecht Herb.). An Aublet specimen at the British Museum Herbarium, also sterile, has both large (23 × 12 cm.) and small leaflets, and the smaller ones agree in size, texture, venation, scale-dotting, etc., with those of the uniformly small-leaved, type collection (*Sagot* 418, Kew Herb.) of *P. sagotii*. Allowing for thin to become thick and less reticulate-veined, I believe that the smaller leaflets of the type of *P. alliaceum* are certainly conspecific with those of Aublet's specimen, and thus with *P. sagotii*, which has a small calyx. It is therefore possible to connect Lamarck's type with this form, which is apparently the more common of the two, but it cannot be proved that the liana from which it came would not, in fact, have produced an inflorescence with a large calyx. My friend, Mr. J. P. M. Brenan, has suggested to me—and I fully agree with him—that in such a situation the most logical course is to divide the flowering material of the taxon into two varieties based on the size of the calyx, and to refer the type material and other sterile specimens simply to the species, without further definition. In this situation it becomes unreasonable to follow Article 34 of the present International Code of Botanical Nomenclature, and to create a "var. *alliaceum*" whose extension would evidently be confined to the concrete material of the type in the Paris Herbarium. This being so, I propose the two varieties for the flowering material, as follows :

Pseudocalymma alliaceum (Lam.) Sandwith, var. **microcalyx** Sandwith, var. nov. ; calyce statu sicco 4-7.5 mm. longo distinguitur.—*P. sagotii* (Bur. et K. Schum.), *P. langlasseanum* (Kränzln.) et *P. macrocarpum* (Donn. Sm.) omnia Sandwith in Rec. Trav. Bot. Néerl. **34**, 210 (1937). *P. pachypus* (K. Schum.) Sandwith, loc. cit. 211. *P. laevigatum* (Bur. et K. Schum.) Samp. et Kuhl., necnon *P. macrocarpum* (Donn. Sm.,

Sandw. cum. syn. omn., sec. Seibert in Carnegie Inst. Wash. Publ. **522**, 401-2 (1940). Verosimiliter etiam *P. pohlianum* (Bur. et K. Schum.) Sandw., loc. cit. 211, necnon *P. hymenaeum* (DC.) Sandw. in Candollea, **7**, 247 (1937). *Adenocalymma obovatum* Urb. in Fedde Rep. Spp. Nov. **14**, 307 (1916), ex descr.

Calyx when dried 4-7.5 mm. long.

FRENCH GUIANA. Karouany, 1855, *Herb. Sagot* 418 (type in Kew Herb.; type no. of *P. sagotii*). Without details, *Martin* (Herb. Paris.).

Distr. Mexico (southwards from Sinaloa, San Luis Potosi and Tamaulipas; Tres Marias Is., *H. L. Mason* 1770); Central America; West Indies (St. Vincent, *Anderson*, and cult. in other islands); Panama (*Sutton Hayes* 610); Colombia (llanos at foot of E. Cordillera, *André* 1035); Venezuela (Lara, *Pittier* 11204); Ecuador (Atacames and Guayaquil, *Sinclair*; Guayaquil, "*Ruiz and Pavón*" (*Tafalla* ?) in Herb. Mus. Brit.; *Espinosa* 1759; *Camp* 3876); Peru (Tarapoto, *Spruce* 4475); British Guiana (Kanuku Mts., *A. C. Smith* 3355); Brazil.

Pseudocalymma alliaceum (Lam.) Sandwith, var. ***macrocalyx*** Sandwith, var. nov.; a var. *microcalyce* Sandw. calyce statu sicco multo majore scilicet 1-2 cm. longo apice ad 2 cm. lato differt.—*P. standleyi* Steyermark in Field Mus. Publ., Bot. Ser. **23**, 235 (1947).

Differs in the much larger calyx which is 1-2 cm. long and, when flattened, up to 2 cm. broad at the apex. The upper part of the calyx often appears membranous with an irregular frilly margin. The inflorescence is usually a long, lax, few-flowered thyrse, with rhachis, branchlets and pedicels much flattened and glabrate. The young capsule of *Jenman* 6752 is up to about 40 cm. long and 2.1 cm. broad.

BRITISH GUIANA. Demerara River, June 1894, *Jenman* 6752 (type in Kew Herb., duplicates in New York Herb.).

Distr. Brazil (Rio Solimões basin, *Krukoff* 7842; Pará, without collector's name, in Herb. Paris.); Peru (Dept. San Martin, *Klug* 4138; Dept. Loreto, *Klug* 3096); Venezuela (La Guaira, 1865, *Moritz* 347 in Herb. Mus. Brit.); Guatemala (Dept. Quezaltenango, Jan. 1940, *Steyermark* 33533, type of *P. standleyi* in Chicago Nat. Hist. Mus. Herb.).

Dr. Steyermark's gathering has outstandingly large calyces but otherwise agrees well with other specimens of var. *macrocalyx*. The occurrence in Guatemala implies no discontinuity in the distribution of the variety, which will doubtless be collected between Guatemala and Venezuela. So far as I know, the specific name *P. standleyi* is the only one available for those who cannot swallow my broad treatment of *P. alliaceum*.

Certain specimens from French Guiana, viz. *Herb. Sagot* 410, *Mélinon* 62, 66 (all in Herb. Paris.) seem to belong to var. *macrocalyx*. The inflorescences of these specimens are very short, and there are two well-defined longitudinal lines of plate-shaped glands on the outside of the lower half of each corolla lobe and descending down the tube such as I have not found on other specimens of *P. alliaceum*. It is possible that these specimens, which look as if they belonged to a single gathering, represent a truly distinct plant, especially as *Sagot* noted on the label of his example that the flowers had a smell of vanilla, while the dried

leaflets do not now smell of garlic. Nevertheless, Bureau referred these specimens to *Bignonia alliacea* Lam., and I am inclined to agree with him.

The following is a list of collections of *P. alliaceum* of which I have seen only vegetative material : Tobago, ann. 1761-1777, *J. Gregg* (Herb. Mus. Brit.), foliage agreeing well with that of the Anderson (St. Vincent) collection of var. *microcalyx* cited above ; British Guiana, *Parker* ; Surinam, *Lanjouw and Lindeman* 430 (Utrecht Herb.), 3246 ; French Guiana, without collector's name, type of *Bignonia alliacea* Lam. in Herb. Jussieu, Herb. Paris., *Etienne* (Herb. Paris.), *Aublet* (Herb. Mus. Brit.) ; Brazil, Maracassumé Region, Maranhão, *Froes* 1790, *T. Moses* 80 (Herb. Mus. Brit.).

Lamarck's description of the tendril of *Bignonia alliacea* as simple is, in my opinion, an error. Perhaps he examined only a mutilated example. So far as I know, the tendrils of *Pseudocalymma* are always trifid at the apex.

Various authors, including myself, have described the calyx of *Pseudocalymma* as more or less gland-less, and Sampaio and Kuhlmann even emphasised this character, but further experience has shown that, in fact, plate-shaped glands frequently occur in well-defined fields on the calyx of *P. alliaceum*.

It was unfortunate that Swartz described the flowers of his *Bignonia alliacea* as "albidi". He was followed by Miers and Grisebach, who described the corolla as "alba", "white". No doubt, a form of this species occurs with white corollas, but I have no evidence of its existence.

A Brazilian botanist, J. C. Gomes, has recently, in *Arq. Jard. Bot. Rio de Janeiro*, **9**, 226, t. on p. 233 (1949), disagreed with my transference of *Bignonia alliacea* Lam. to *Pseudocalymma*. He maintains it in *Adenocalymma*, partly on the grounds of the short, semicylindric capsule. It is obvious that Gomes' "*Adenocalymma alliaceum*" has nothing whatever to do with the true plant. Where did he get this conception of the fruit ? If it was from Miers' description in *Ann. Nat. Hist. ser. 3*, **7**, 395, that, according to Miers himself, came from Splitgerber, and Splitgerber's "*Bignonia alliacea*," as I pointed out in *Rec. Trav. Bot. Néerl.* **34**, 211, is *Distictella racemosa*.

Phryganocydia phellosperma (Hemsl.) Sandwith in *Kew. Bull.* **1940**, p. 302.

COLOMBIA. Pacific Coast, Dept. Choco : Cupica, "en playa inundada", June 1950, *A. Fernandez* 358 (Herb. Nac. Colombiano ; *Kew. Herb.*).

Apparently the first record for Colombia of a species known previously only from the Panama Canal Zone (cf. *Tabebuia palustris*).

Xylophragma seemanniana (Kze.) Sandwith, comb. nov.—*Saldanhaea seemanniana* Kze., *Rev. Gen.* **2**, 480 (1891) ; Seibert in *Carnegie Inst. Wash. Publ. No.* **522**, p. 398 (1940) ; Dugand in *Caldasia*, **3**, 261 (1945). *Bignonia dentata* DC. sec. Seem. *Bot. Herald*, 179 (1854), non DC. *Distictis rovirosana* Donn. Sm. in *Bot. Gaz.* **20**, 7 (1895). *Adenocalymma cocleense* Pittier in *Contr. U.S. Nat. Herb.* **18**, 255 (1917). *Tecoma floccosa* Klotzsch ex Bur. et K. Schum. in *Mart. Fl. Bras.* **8**, pars 2, 318 (1897).

Tabebuia floccosa (Klotzsch ex Bur. et K. Schum.) Sprague et Sandwith in Kew Bull. **1932**, p. 27 ; Sandwith, *hic supra*, p. 452.

Distr. From S. Mexico through Central America to N. Colombia, Venezuela, Trinidad and British Guiana.

This very distinct and beautiful liana has, on present evidence, a restricted distribution in the Caribbean area. Seibert and Dugand (*loc. cit.*) both realized that the fruit does not accord well with those of other species of *Saldanhaea*, but it is clear that neither of these writers can have compared material of the well-known Brazilian species, *S. lateriflora* (Mart.) Bur., which is the type species of the genus. Otherwise, I cannot believe that Seibert would have written his concluding remarks with such conviction, especially if he had examined the pollen. The fruit of *Saldanhaea lateriflora* not only is elongate-linear but also, as pointed out by Bureau, is unique in possessing two sharp parallel median ribs on the back of the valves. What is surprising is that neither Seibert nor Dugand have noted the far closer superficial resemblance of *S. seemanniana* to the two species of *Saldanhaea* for which Sprague created the new genus *Xylophragma*. If they had, they would have discovered that the broad, woody capsule of *S. seemanniana* agrees well with that of *Xylophragma*, and the number of rows (8) of ovules in each chamber of the ovary is the same, whereas it is only 4 in *S. lateriflora* and its too close ally, *S. confertiflora*. (*S. heterocalyx* Bur. et K. Schum., with 6 rows in each loculus, must be removed from *Saldanhaea*, as *Orthotheca heterocalyx* Pichon, on account of its facies, its calyx and its pollen). Again, the branched, crystal-like (not "stellate") hairs which are so noticeable on young parts of *S. seemanniana* can be found, though much more sparsely, on the pedicels and calyces, and occasionally along the midrib of the lower surface of leaflets, of species of *Xylophragma*. Yet again, the tetraquetrous and furrowed style and the divaricate (not curved) anther thecae, are characters common to both groups and the latter, at least, is not found in true *Saldanhaea*. Finally, the pollen-grains of *S. seemanniana* are monads with three colpi, just as in *Xylophragma*, which is sharply distinguished by this character, as Urban first pointed out, from *Saldanhaea lateriflora* whose pollen-grains are united into tetrads ; and here I wish to record my special gratitude to Prof. G. Erdtman who kindly made preparations from material I sent him of *S. lateriflora*, *S. seemanniana* and *Xylophragma pratense*, and who wrote at once that the pollen-grains of the two latter are of similar form but that the reticulation in those of *Xylophragma pratense* is somewhat finer than in those of *S. seemanniana*.

From the above remarks, I think it is clear, first, that *Saldanhaea seemanniana* cannot continue to occupy its present position in *Saldanhaea* and, secondly, that it fits well, both in facies and scientific characters, into the genus *Xylophragma*. I have accordingly proposed the new combination, as above.

Anemopaegma chrysoleucum (H.B.K.) Sandwith in Lilloa, **3**, 459 (1938).—*Bignonia chrysoleuca* H.B.K., Nov. Gen. et Sp. Pl. **3**, 134 (1819). *Anemopaegma paraense* Bur. et K. Schum. in Mart. Fl. Bras. **8**, pars. 2. 131 (1896) ; Sandwith in Pulle, Fl. Suriname, **4**, part 2, 35 (1938), cum syn. *A. grandifloro* Sprague et *A. surinamensi* Sprague. *A. belizeanum*

[“*balizeanum*”] Blake in Contr. Gray Herb. **52**, 91 (1917) ; Seibert in Carnegie Inst. Wash. Publ. **522**, 426 (1940).

Since I referred this species to its correct position in the genus *Anemopaegma* I have had a further opportunity of examining the type specimen (Bonpland 1576) in the Paris Herbarium, and can add a few details to Kunth's description. The single branchlet, which is young and slender and was removed near its apex, is subtetragonous rather than tetragonous and is minutely puberulous at the nodes. The pseudostipules are conspicuous, foliaceous and more or less orbicular, somewhat less than 1 cm. long and broad, and scattered-punctate. The petiolules are puberulous with minute curved hairs. The tendrils are apparently simple at the apex. The leaflets are relatively narrow, elliptic-oblong, up to 6 inches long and 2 inches broad, as described by Kunth, and quite thin and chartaceous, only inconspicuously punctate here and there on the upper surface, but quite copiously and conspicuously so on the lower, midrib minutely puberulous on the upper surface, main lateral nerves 7-8 on each side of it, veinlets prominulous and forming a fairly intricate network on both surfaces. The inflorescence was evidently very short and axillary, scarcely exceeding the pseudostipules. The single calyx visible is barely 6 mm. long, glabrous but with gland-fields. Fragments of only a single corolla are with the specimen. This was evidently quite short, probably only 4-4.5 cm. long ; the tube is completely glabrous on the outer surface, while the lobes are densely glandular-lepidote within.

In my opinion this specimen represents a form with thin leaflets, taken from near the top of a young branchlet, of a widespread species occurring from British Honduras and Guatemala to Amazonian Brazil and Peru, and apparently also in Trinidad (the specimens from this island were cultivated in the Botanic Garden, but the plant was reported to have been “brought in from the woods”). This species has usually been known, in recent years, as *A. paraense* Bur. et K. Schum., and in my account of the *Bignoniaceae* for the Flora of Surinam I reduced to it both *A. surinamense* Sprague (Surinam) and *A. grandiflorum* Sprague (Trinidad). Further study has shown that *A. belizeanum* Blake is obviously conspecific, and I suspect that *A. punctulatum* Pittier et Standley (a large-flowered form, from Panama and Costa Rica) and *A. macrocarpum* Standley (a small-flowered form, from Panama) are also synonymous but I have seen the type specimens of neither.

The important features of this species, which is extremely variable in the texture and size of the leaflets, the size of the calyx and the length of the corolla, are the foliaceous roundish pseudostipules (which, naturally, are smaller towards the tops of the branchlets), the short indumentum of the petioles, the petiolules and the midrib of the upper surface of the leaflets, the rather numerous (usually more than 6) main lateral nerves on each side of the midrib, the very short axillary inflorescence and, perhaps above all, the quite glabrous outer side of the corolla tube. The last-named feature was not noticed by someone (Bureau ?) in the Paris Herbarium who had placed the Bonpland type specimen of *Bignonia chrysoleuca* with the sheets of *Funck and Schlim* 707 and 709, on which were written the legend “*Anemopaegma funckianum* nova species” in Bureau's writing (cf. Lilloa, **3**, 460). But *Funck and Schlim* 707 and 709 have the smaller leaflets with fewer lateral nerves (up to 6), the smaller and

narrower pseudostipules, and especially the glandular-lepidote outer side of the corolla tube of a truly distinct species occurring commonly in Venezuela, in Trinidad and Tobago, and near the coast in British Guiana, for which the earliest correct name seems to be *A. carrerense* Armitage, although *A. karstenii* Bur. et Schum., of which I have seen no specimen, may eventually take precedence. In this connexion, I must remark that Seibert (l.c.), in describing *A. belizeanum*, describes the corolla as "densely and minutely glandular-lepidote". His statement surely applies only to the inner surface of the corolla lobes: the entire corolla is glabrous on the outer surface on material of two collections cited by him, viz. *Schipp* S.566 and S.566A, which I should refer to *A. chrysoleucum*.

Recently, I have examined several sheets of *A. chrysoleucum* from the Colombian National Herbarium, and at least two of them, viz. *Romero-Castañeda* 104, from Tucurinca, Dept. Magdalena, and *Dugand* 4535, from banks of the Rio Magdalena, lower down in Dept. Atlántico, agree very well with Bonpland's specimen which came from the same region.

Anemopaegma lehmannii *Sandwith*, sp. nov. ; inter species ramulis folisque dense indutis gaudentes foliolis ellipticis coriaceis supra asperulis valde reticulatis, pseudostipulis haud foliaceis, praesertim pedicellis longis flexuosis, ovulis pro loculo biseriatis optime distinguenda.

Frutex, alte scandens, partibus summis omnibus pilis simplicibus inaequalibus patentibus plus minusve dense vestitis subvelutinis ; rami subteretes, annotini conspicue hornotini tenuiter striato-costati, cortice annotinorum aliquantum laccato fissili ; pseudostipulae haud foliaceae sed inconspicuae gibboso-ovoideae, brunneae, nitidulae ; internodia longa, vulgo 10-15 cm. *Folia* bifoliolata, cirrho nullo viso, petiolis satis crassis ad 4.5 cm. longis, petiolulis vulgo 1-1.7 cm. longis ; foliola elliptica, rarius subobovato-elliptica, apice breviter acuminata vel cuspidata, basi obtusa plicatula, 9-15.5 cm. longa, 3-7.2 cm. lata, coriacea, margine brunneo cartilagineo, supra nitidula asperula crebre sed haud dense pilosula, subtus dense pilosula velutina, utrinque lepidotopunctata, costa supra impressa subtus prominente, nervis primariis lateralibus utroque costae latere 6-8 utrinque prominentibus, rete venularum supra valde prominente brunneo-cartilagineo subtus etiam conspicuo. *Inflorescentiae* ramulos novellos terminantes, breves, racemosae, ubique dense pilosulo-pubescentes ; bractae bracteolaeque minutae, mox deciduae ; pedicelli graciles flexuosi, 2-3.5 cm. longi. *Calyx* campanulatus, margine integro haud denticulato, 5-6 mm. longus, apice ad 8 mm. latus, extra margine pallidiore corneo excepto dense minute pubescens subtomentellus. *Corolla* lutea, infundibuliformis, 4-6 cm. longa ; tubus basi per 1 cm. anguste cylindricus, utrinque glaber (neque pubescens neque glanduloso-lepidotus), nisi zona pilorum papilliformium circa insertionem staminum praeditus ; limbus 3-4 cm. diametro, extra glanduloso-lepidotus necnon minute pubescens atque ciliolatus, intus glanduloso-lepidotus. *Stamina* 1 cm. supra tubi basin inserta, longiora circiter 2.5 cm. breviora 2 cm. longa, omnia nisi insertionem glabra ; antherarum thecae divergentes, saepe arcuato-pendulae, 3-4 mm. longae, glabrae ; staminodium sigmoideo-curvatum, circiter 3 mm. longum, glabrum. *Discus* magnus, pulvinatus, 2 mm. vel paulo ultra altus, 3.5-4 mm. latus. *Ovarium* oblongum, utrinque attenuatum,

praesertim infra supra discum in stipitem 1.5 mm. longum contractum, conspicue angulato-subquadrangulare, brunneo-tomentosum, circiter 4.5–5 mm. longum, 1.5–1.8 mm. latum ; ovula pro loculo biseriata, in quaque serie 13–14 ; stylus cum stigmatibus 3–3.3 cm. longus, basi excepta glaber. *Capsula* non visa.

COLOMBIA. Dept. Cauca ; borders of dense forests above Inzá, eastern slopes of Central Andes of Popayan, 1800–2000 m., fl. March and April, *F. C. Lehmann* 4474 (type in Kew Herb.). Noted as a rare liana, with stems as thick as a thumb, up to 20 m. long ; leaves leathery, dark bluish green, faintly shining ; flowers bright yellow (*leuchtend gelb*).

A very distinct species, without obvious affinities. The distinctive characters are the strong indumentum of all the vegetative parts ; the absence of foliaceous pseudostipules ; the elliptic, coriaceous leaflets, which are strongly reticulate and somewhat rough to the touch on the upper surface, and velvety beneath ; the peculiarly long, flexuous pedicels ; the relatively small calyces ; and the biseriate ovules, with numerous ovules in each series.

Pseudopaegma colombianum *Sandwith*, sp. nov. ; *P. jucundo* (Miers) Urb. affinis, pseudostipulis conspicuis, foliolis subtus conspicue punctatis, calyce pilis longis induto, praesertim corollae tubo extra copiose glanduloso-lepidoto valde distincta.

Frutex scandens, partibus omnibus vegetativis pilis simplicibus articulatis patentibus inaequalibus majoribus ad 1.5 mm. longis satis dense indutis vel etiam villosis ; ramuli subteretes, tenuiter costati ; pseudostipulae foliaceae, suborbiculares, rotundatae vel cuspidatae, 0.4–1 cm. longae, ad 1.3 cm. latae, subtus conspicue pilosae atque lepidotopunctatae. *Folia* bifoliolata, cirrho apice trifurcato terminata, petiolis 2.5–4 cm. longis, petiolulis 0.8–1.5 cm. longis ; foliola ovata vel elliptica, apice acute acuminata vel acumine obtuso mucronulata, basi rotundata atque levissime cordata, ad 9 cm. longa, vix ad 5.5 cm. lata, chartacea, supra breviter haud dense sed regulariter pilosula vel nervis tantum pilosulis pagina glabrata, subtus nunc satis sparse nunc dense pilis articulatis longiusculis induta, utrinque praesertim subtus lepidotopunctata, lepidibus inaequalibus in foveis conspicuis insidentibus, costa nervisque lateralibus utroque ejus latere circiter 6 supra impressis subtus elevatis, supra intricatissime areolato-rugosula subtus laxe reticulata. *Inflorescentia* brevis, terminalis, racemosa (an semper ?), ubique velut ramuli pilis patentibus inaequalibus articulatis induta ; bractee bracteolaeque filiformes, flexuosae, 3–5 mm. longae ; pedicelli 5–9 mm. longi. *Calyx* campanulatus, membranaceus, costis conspicuis in dentes prolongatis ; tubus 7–9 mm. longus, apice ad 8 mm. latus, longe pilosus atque conspicue inaequaliter lepidotus ; dentes ut in *P. jucundo* conspicui, subulati, ad 5.5 mm. longi, pilosi atque lepidoti. *Corolla* lutea, campanulato-infundibuliformis, 4–5 cm. longa ; tubus basi per 1–1.5 cm. anguste cylindricus, extra dense glanduloso-lepidotus, ceterum glaber zona pilorum papilliformium circa insertionem staminum excepta ; limbus circiter 2.5 cm. diametro, lobis ciliatis ceterum glabris. *Stamina* thecis antherarum divaricatis circiter 3.5 mm. longis. *Discus* magnus, conico-pulvinatus, superne in ovarium constrictus, 2 mm. altus. *Ovarium* ovoideo-ellipsoideum, marginibus ambobus costatum, 2.5 mm. longum,

1.7 mm. diametro, dense lepidotum ; ovula pro loculo quadriseriata, in quaque serie 3-4 ; stylus cum stigmatibus fere 3.5 cm. longus, glaber. *Fructus* non visus.

COLOMBIA. Meta : Villavicencio, Los Llanos, hacia El Parrao, 500 m., Nov. 10th, 1938, *J. Cuatrecasas* 4605 (type in Herb. Nac. Colombiano). Antioquia : Camino de Caldera a San Luis, April 14th, 1949, *R. Romero-Castañeda* 1513 (Herb. Nac. Colombiano).

This species is easily distinguished from *P. jucundum*, of British and Brazilian Guiana, by the characters given in the diagnosis. The material of both collections is scanty, and the dimensions of the leaflets may well be increased. Only one tendril was unbroken at the apex. The corolla tube of *P. jucundum* is virtually glabrous outside ; only a very few, scattered, minute, shining scales can be seen under a strong lens.

***Pseudopaegma longidens* (DC.) Urb.** in Ber. Deutsch. Bot. Ges. **34**, 740 (1916).

BRAZIL. Pará : Belém, capoeira do Instituto Agronômico do Norte, fl. Jan. 1950, *T. Guedes* 244 (Kew Herb.).

This specimen agrees well with the descriptions, and with the photograph of the Munich Herbarium type specimen, of this very rarely collected species which was first gathered by Martius in Pará. Note-worthy characters are the gland-fields on the branchlets at the nodes ; the laxly and openly but prominently reticulate, subcoriaceous, yellowish-green, glabrous leaflets which are shining above and glandular-punctate beneath ; and the plate-shaped glands on the outer side of the corolla lobes. The last-named character, evident in the photograph of the type, was mentioned by De Candolle but was quite obscured in the Flora Brasiliensis by Schumann, who wrote of the corolla of *Anemopaegma longidens*, " Utrunque glandulis minutis inspersa ". Guedes' specimen shows that the nodding inflorescences may be axillary as well as terminal, while the calyx tube of his material is 6-7.5 mm. long and minutely papillose-pilosulous.

***Pseudopaegma mirabile* Sandwith**, sp. nov. ; *P. jucundo* (Miers) Urb. affinis, sed ob foliola parva obtusa mucronulata vel etiam retusa, pedicellos calycesque pilis crebris apice glanduliferis indutos, dentes calycinis longissimos distinctissima.

Frutex scandens, ramis teretibus tenuiter costatis, annotinis defoliatis glabris, hornotinis pilis simplicibus articulatis patentibus valde inaequalibus nonnullis apice glanduliferis satis dense indutis ; pseudostipulae nullae. *Folia* bifoliolata, nonnulla cirrho brevi simplici (an semper ?) terminata, parva, petiolis 5-6 mm. tantum longis, petiolulis 2-2.5 mm. longis flexuosis saepe recurvis, omnibus indumento ramulorum dense villosis ; foliola parva, elliptica vel elliptico-oblonga, apice obtusa mucronulata vel nonnunquam rotundata retusa, basi rotundata nonnunquam conspicue obliqua, 2-4.2 cm. longa, 1-2.2 cm. lata, firme chartacea, supra pilis e basi tumida nitente brunnescente orientibus setuloso-pilosula, subtus similiter sed longius pilosa, haud obvie lepidoto-punctata, costa nervisque primariis utroque ejus latere 4-5 supra prominulis subtus prominentibus, venulis utrinque praesertim supra obviis laxe reticulatis.

Flores in fasciculum (vel thyrsus reductum) terminalem densum speciosum congesti; bracteae bracteolaeque filiformes, deciduae; pedicelli 5–8 mm. longi, pilis simplicibus vel apice conspicue glanduliferis dense villosuli. *Calyx* campanulatus, membranaceus; tubus 6.5–8 mm. longus, apice ad 7 mm. latus, satis dense villosulus, pilis plerisque apice conspicue glanduliferis, costis sub dentibus haud conspicuis; dentes subulati pro genere longissimi, 1.5–2.3 cm. longi, flexuosi, indumento simili. *Corolla* lutea, pro genere satis anguste campanulato-infundibuliformis, 3.5–4.5 cm. longa; tubus basi per 1–1.5 cm. anguste cylindricus, extra glaber, haud glanduloso-lepidotus, intus praesertim superne glanduloso-lepidotus praeterea zona papillarum apice glanduliferarum circa insertionem staminum praeditus; limbus 1.5 cm. (statu vivo verosimiliter ad 2 cm.) diametro, glaber, lobis brevibus ut videtur circiter 6 mm. longis. *Stamina* thecis antherarum divergentibus 3.5 mm. longis. *Discus* pulvinatus, fere 2 mm. altus, apice infra ovarium in stipitem contractus. *Ovarium* ovoideo-ellipsoideum, compressum, 2 mm. longum, 1.5 mm. diametro, dense minute lepidotum; ovula pro loculo ut videtur triseriata, in quaque serie 4. *Fructus* non visus.

BRAZIL. Piahy: banks, Gurgea [Rio Gurgueia], August 1839, Gardner 2679 (type in Kew Herb., isotype in Herb. Mus. Brit.). "A climber. Fls. yellow".

Like so many of Gardner's discoveries in the *catinga* country of N.E. Brazil this is a very unusual plant, but the affinity seems clear. The gland-tipped trichomes which are so plentiful on the pedicels and calyces are rarely found in tropical American *Bignoniaceae*, and in this species take the place of the normal sessile gland-like scales. The small leaves with simple tendrils, the glandular-lepidote inner surface of the corolla tube, and the remarkably long calyx teeth, are other notable characters of this very distinct species, which does not seem to have been re-collected.

Pseudopaegma oligoneuron Sprague et Sandwith in Kew Bull. 1932, 88.

COLOMBIA. Meta: Sierra de la Macarena, Cano Entrada, 475 m., fl. Dec. 1949, W. R. Philipson 1761 (Herb. Mus. Brit. and Kew Herb.): climber in dense humid forest, with inflated yellow calyx and pale yellow flowers.

The first record for Colombia.

Distictis robinsoni Johnston in Contr. U.S. Nat. Herb. 12, 110 (1908) is ***Anemopaegma carrerense*** Armitage in Journ. Bot. 1898, p. 188, a species well known in Trinidad, Tobago, eastern Venezuela and the coastal region of British Guiana.

An excellent photograph of the type specimen of *D. robinsoni* (coll. Robinson and Lyon, at La Guaira, Venezuela), which was kindly presented by the United States National Herbarium, immediately suggested the identity of this species, on which no-one, I think, has commented since its description. The only objection to the assignment of *D. robinsoni* to *Anemopaegma carrerense* were the simple tendrils, as appeared in the photograph (in *A. carrerense* the tendrils are trifid), and the description of the corolla as glabrous. Dr. Lyman Smith, of the United States National Herbarium, has kindly examined the specimen and reports that the

tendrils are all broken, so that it is impossible to say whether they were trifurcate or not, while the corolla is glandular-lepidote outside and especially in the cylindric basal portion, exactly as in *A. carrerense*. He adds that, in his opinion, the specimen agrees perfectly with *La Cruz* 2472, 3922 and 4347, from British Guiana, all labelled *Anemopaegma carrerense*. I have myself identified as *A. carrerense* specimens of these three collections in the Herbarium of the New York Botanical Garden. I should add that *A. carrerense* is possibly conspecific with the earlier described *A. karstenii* Bur. et K. Schum., the type of which was collected at Puerto Cabello, Venezuela. The type, if at Berlin, was presumably destroyed during the late War. I have seen no specimen or photograph of *A. karstenii*.

Distictella cuneifolia (DC.) Sandwith, comb. nov.—*Pithecoctenium cuneifolium* DC. Prodr. 9, 196 (1845).

BRAZIL. Pará, without collector's name or number (Herb. Paris., type ! Herb. DC. Prodr., Geneva, fragment ! Photos at Chicago Nat. Hist. Mus. and Kew Herb.).

FRENCH GUIANA. Maroni, Dr. Audouy (Herbier de la Guyane, Herb. Paris.).

The type specimen of this species was written up by Bureau, ms., as *Distictis cuneifolia* Bur., and it is an obvious *Distictella*, near to but apparently distinct, if only on account of the shape of the leaflets, from the widely distributed *D. racemosa* (Bur. et K. Schum.) Urb., and in any case described much earlier. Notes made by me at Paris in January, 1937, are as follows : *branchlets* finely tomentellous ; *petioles* pubescent, only 5–10 mm. long ; *petiolules* pubescent, swollen at both ends, 4–8 mm. long ; *leaflets* up to only 7.5 cm. long and 3.5 cm. broad, obovate to obovate-lanceolate, shortly cuspidate or almost obtuse at the apex, coriaceous, lepidote (less than on lower surface) and all nerves impressed above, copiously lepidote beneath, main lateral nerves 6–8 on each side of the midrib, prominulous and anastomosing, arcuate-ascending ; *pedicels* up to 1.5 cm. long ; *calyx* 7.5–9 mm. long, densely tomentellous, gland-fields obscure or absent ; *corolla* widely ampliate above basal portion, densely pubescent outside, about 5.5 cm. long, the limb 4.5 cm. in diameter.

Distictella dasytricha Sandwith, sp. nov. ; *D. elongatae* (Vahl) Urb. atque *D. mansoanae* (DC.) Urb. affinis, ab ambabus et a ceteris speciebus cognitis indumento omnium partium e pilis plerisque conspicue longioribus composito differt ; praeterea ab illa inflorescentia brevi racemosa pauciflora, ab hac petiolis brevibus robustis foliolis plus minusve obovatis apice saepius rotundatis capsula seminibusque ut videtur minoribus distinguitur.

Frutex sarmentosus, scandens ; ramuli, petioli, petioluli, foliola infra, inflorescentiae, calyces pilis mollibus patulis flavescentibus plerisque quam in ceteris speciebus longioribus sublanato-tomentosi. *Folia* bifoliolata, petiolis 1.5–2 cm., petiolulis apice subtus incrassatis 1–2 cm. longis ; foliola obovato-elliptica, obovato-oblonga vel obovata, apice vel rotundata atque nonnunquam late emarginata vel breviter acuminata, basi

ipsa rotundata vel obtusa sed saepe basin versus cuneatim attenuata, adulta 9-15.5 cm. longa, 5.5-9.5 cm. lata, coriacea, supra juventute pagina satis sparse nervis dense pilosa demum nervis exceptis glabrata sed minute lepidota, subtus pilis mollibus inaequalibus flexuosis dense subvelutino-pilosa, costa nervisque supra canaliculato-impressis subtus prominentibus, nervis primariis utroque costae latere 5-7 ascendentibus saepius vix arcuatis, secundariis subhorizontalibus, rete venularum subtus sub pilis prominente. *Inflorescentia* ramulos breves axillares terminans, satis brevis pauciflora, 3-15 cm. longa, racemosa (an semper ?), ubique conspicue dense sublanato-pilosa; bracteolae prope vel supra medium pedicellum affixae, mox deciduae, clavato-lineares, 4-6 mm. longae; pedicelli 1.5-2.5 cm. longi. *Calyx* forma generis typica, truncatus denticulis haud distinguendis, 1-1.3 cm. longus, indumento inflorescentiae notabili vestitus, consociebus glandularum 4 inconspicuis extra sub apice praeditus. *Corolla* alba, intus flavescens, suaveolens, infundibuliformis, saepe sigmoideo-curvata, 5-7 cm. longa; tubus parte basali cylindrica utrinque glabra, ceterum extra pilis pro genere longis velutino-tomentosis intus ubique supra insertionem staminum crebre papilloso-pilosus et glanduloso-lepidotus, circa insertionem ipsam longe papilloso-villosus; limbus 4-5 cm. diametro, utrinque minute papillosus vel glanduloso-lepidotus. *Stamina* glabra, longiora 2.5 cm., breviora 2-2.2 cm. longa; antherarum thecae divaricatae, 4.5-5 mm. longae; staminodium 6 mm. longum. *Discus* crassus, carnosus, 3 mm. altus, inferne annularis, tum elevato-conicus. *Ovarium* ovoideo-ellipsoideum, 5 mm. longum, 3.5 mm. diametro, dense piloso-tomentosum; ovula pro loculo 4-seriata; stylus cum stigmatibus 3.3 cm. longus, apice glabrescente excepto dense piloso-pubescent; stigmata suborbiculari-ovata, acuminata, 3 mm. longa atque lata. *Capsula* elliptico-oblonga, apice basique obtusa, 7-7.5 cm. longa, 3-3.5 cm. lata, valvis subvelutino-tomentosis, costa angusta satis argute elevata; semina brunnea, ad 1.5 cm. longa, ad 3.5 cm. lata, alis membranaceis embryone pallidioribus.

BRAZIL. Goyaz: Municipio Yatai (Jatahy), Queixada, fl. July 8th, 1949 (type in Kew Herb.), fr. Oct. 28th, 1950, A. Macêdo 1906. "Sarmentaceous, from marsh forest. Flowers fragrant, white, yellow within."

Well-marked by the shaggy indumentum, which is matched in no other known species of *Distictella*, and by the short racemose inflorescence. The hairs mostly exceed 0.5 mm. in length, whereas those of related species are usually much shorter. The short, thick petioles, and the more or less obovate (often rounded and emarginate) leaflets recall *D. elongata*, of Guiana and Venezuela, but a much closer relationship is likely with *D. mansoana*, which occurs frequently in this part of Brazil, and of which the present plant may eventually prove to be a well-marked variety.

Distictella magnoliifolia (H.B.K.) Sandwith in Lilloa, **3**, 460 (1938). — *Bignonia magnoliifolia* H.B.K. Nov. Gen. et Sp. Pl. **3**, 136 (1819). *Distictis kochii* Pilger in Koch-Grünberg, Zwei Jahre unter den Indianern, **2**, 372 (1910) et in Fedde Rep. Spp. Nov., **8**, 151 (1910). *Distictella kochii* (Pilger) Urb. in Fedde Rep. Spp. Nov., **14**, 310 (1916).

When I referred this species to *Distictella*, after examining the Bonpland type specimen at Paris, I indicated its affinity with *D. racemosa* (Bur. et K. Schum.) Urb. Since then, many collections identified as *D. racemosa* have accumulated from various parts of Northern South America, and I therefore welcomed a recent opportunity of re-examining the precious type of *D. magnoliifolia* which, incidentally, has been photographed (Neg. No. 39415) by Mr. Macbride for the Chicago Natural History Museum. It is unfortunate that the material is disastrously fragmentary, consisting of three leaflets, an elongated inflorescence, two mutilated corollas and fragments of a calyx. Kunth's description gives the correct measurements for the two larger leaflets and is more or less accurate so far as it goes, but important details are omitted and there are two very serious errors. The calyx is described as "glabriusculus", whereas its outer surface is covered with the fine tomentum commonly found in calyces of *Distictella*, and the characteristic gland-fields are also evident. Worse still, the corolla is described as glabrous, whereas its outer surface is that of a typical *Distictella* flower, that is to say, the basal cylindric part is glabrous, but the rest is densely and finely tomentose.

Certain details omitted by Kunth, and by myself in my former note, can now be mentioned. The larger leaflets are quite broadly elliptic or ovate-elliptic. They are glabrous, but are covered all over the lower surface with small shining scales, which are not, however, so close as to touch each other, and these scales are scattered in much smaller quantity all over the upper surface. There are also conspicuous fields of 20-30 small plate-shaped glands in the axils of the lower main lateral nerves, on the lower surface and especially near the base; while similar fields of more elevated glands are noticeable on the under side of the apical acumen, on both sides of the midrib. Except for the basal pair, which is inconspicuous and very close to the margin, there are 4-5 rather steeply arcuate-ascending main lateral nerves on each side of the midrib, thin and slightly raised on the upper surface, prominent on the lower. The reticulation of secondary nerves and veinlets, very intricate, is prominent on both surfaces, and the upper surface is very slightly rough to the touch, but the veinlets are actually somewhat thicker on the lower surface. The two lowest pairs of main lateral nerves are so near the base of the leaflet as to give it a quinquinerved, or at least a quintuplinerved, look. From the fragments of the calyx one supposes that it was 8-10 mm. long. The largest corolla fragment, which represents the complete length of the flower but is shrivelled, is about $1\frac{1}{2}$ inches (4 cm.) long.

This material of *D. magnoliifolia* resembles closely the numerous collections of *D. racemosa*, but differs from all of them in the elevated (not impressed) reticulation of veinlets on both surfaces, which are not curiously shagreened as so often in *D. racemosa*, and from nearly all of them in the definite gland-fields with more numerous glands both in the axils of the lower main nerves and beneath the acumen on the lower surface. Plate-shaped glands do occur in these places on the lower surface of the leaflets of *D. racemosa*, but they are usually less numerous and more scattered, not agglomerated in obvious "fields" (on one collection, *Duque-Jaramillo* 2068 from the "Trapezio Amazónico", there is evidence of numerous glands in distinct fields).

There is one other species of *Distictella* which, in my opinion, agrees

exactly with *D. magnoliifolia*. This is *D. kochii* (Pilger) Urb., which was described from Koch-Grünberg's material collected on the Rio Aiary, a tributary of the Rio Isana, and thus in the Uaupés region some 150 miles S.W. of Javita, which is the type locality of *D. magnoliifolia*. An excellent photograph of the type specimen of *D. kochii* (now, I suppose, destroyed) is fortunately in the Kew Herbarium and this, supported by Pilger's description, shows leaflets and inflorescence agreeing very closely with those of *D. magnoliifolia*, and, above all, the prominulous reticulation of the veins and veinlets on, both surfaces of the leaflets (as mentioned by Pilger) and the gland-fields below the acumen and in the axils of the lower lateral nerves. I have no doubt that *D. kochii* is a synonym of *D. magnoliifolia*, and this interesting fact suggests that the Humboldt and Bonpland species is perhaps a true geographic "taxon", not a mere condition of *D. racemosa*, as one might legitimately have suspected if only the Bonpland specimen had been available. It seems odd that Pilger, when describing his *Distictis kochii*, should have allied it to *D. guianensis* Urb., i.e., to *Distictella parkeri* (DC.) Sprague et Sandwith, rather than to the more obviously related *D. racemosa*. Probably he was relying on the emphasis which Schumann laid on the racemose nature of the inflorescence of *D. racemosa*, but unfortunately this has failed to prove of any diagnostic significance, since there is a complete transition from racemose to thyrsoid on the material of this species.

Although it is likely that *D. magnoliifolia* may prove to be only a local phase of *D. racemosa*, to which I already allow a wide range of variation, I prefer for the present to maintain the two as independent species, especially as I have examined only photographs, fragments and descriptions of *D. magnoliifolia*, while that unfamiliar name, having the earlier epithet, would have to be adopted in the event of union, the need for which is not yet clearly proved.

Bothriopodium Rizzini in Arquivos Jard. Bot. Rio de Janeiro, **9**, 70 (1949), a new genus with a single species, *B. glaziovii* (Bur. et K. Schum.) Rizz., l.c. 71, based on *Distictis glaziovii* Bur. et K. Schum., is a superfluous name, antedated by **Urbanolophium** Melchior in Fedde Rep. Spp. Nov. Beih. **46**, 79 (1927), with type *U. glaziovii* (Bur. ex K. Schum.) Melchior, also based on *Distictis glaziovii* Bur. et K. Schum.

It may be noted that Rizzini provides an original description for *Bothriopodium glaziovii*, taken from two recent collections, and he cites one of these as "Typus". This is not in accordance with the International Code. The type of Rizzini's monotypic genus *Bothriopodium*, and of the single species, *B. glaziovii*, must be taken from one of the two original collections of *Distictis glaziovii*, preferably *Glaziou* 17705. The latter species was, indeed, based on *Pithecoctenium glaziovii* Bur. ex K. Schum. in Engl. and Prantl, Pflanzenfam. **4**, 3 B, 218 (1894), but that name, in the writer's opinion, was insufficiently diagnosed and is virtually *subnudum*.

Adenocalymma dugandii Sandwith, sp. nov. ; *A. calderoni* (Standl.) Seibert ac *A. inundato* Mart. ex DC. ut videtur affinis, ab ambobus corollis albis tubo angustiore extra glabro, staminibus e fauce exsertis connectivo ultra thecas haud conspicue producto statim distat ; praeterea ab illo calyce longiore, ab hoc bracteis majoribus necnon fructu

angustiore seminum alis membranaceis distinguitur. *A. magdalenense* Dugand corollae flavae tubo extra pubescente limbo multo minore differt.

Frutex sarmentosus, erectus vel demum scandens; ramuli glabrati, subteretes, tenuiter pluricostati, crebre lenticellati, juniores siccitate nigrescentes lenticellis pallidis brunneo-cremeis maculati hic illic furfuraceo-pubescentes atque sparse minute lepidoti; internodia summa, praesertim secus ramulos laterales, brevia; pseudostipulae plerumque haud evolutae. *Folia* trifoliolata vel bifoliolata cirrho simplici nonnunquam terminata; petiolus 1.5 cm. longus, in foliis summis velut petioluli gracilis; petioluli velut petiolus superne appianati leviter canaliculati praeterea colore indumentoque ramulorum praediti, laterales vulgo 5–10 mm. longi, terminalis duplo longior; foliola ovata, terminalia saepe elliptica, apice saepius acute acuminata rarius obtusa tantum, basi rotundata atque saepius leviter sed distincte cordata, 3–10 cm. longa, 1.5–5 cm. lata, chartacea vel tenuiter coriacea, siccitate supra plumbea subtus pallidiora saepius glaucescentia, opaca, glabra vel subtus secus costam minute puberula, margine incrassato cartilagineo discolori cremeo, nervis primariis utroque costae latere 6–7 arcuato-ascendentibus ac anastomosantibus, his cum costa supra planis vel prominulis subtus plus minusve prominentibus, venulis utrinque praesertim subtus intricate reticulatis, mesophyllo supra verruculis crebris albidis sub lente forti hyalino-nitentibus praedito, subtus hic illic glandulis raris patelliformibus subimmersis siccitate nigris conspersa. *Racemi* apice ramulorum terminales ac axillares, saepe elongati atque multiflori, rigidi neque flexuosi, 5–15 cm. longi, post flores lapsos cicatricibus oppositis valde conspicuis notati, internodiis 0.6–1.6 cm. longis, indumento furfuraceo subtomentello albido-flavescente praediti; bractae magnae, ellipticae vel obovato-ellipticae, apice attenuatae mucronato-acuminatae vel obtusae mucronatae, basi conspicue attenuatae vel etiam subpetiolatae, 1.3–2 cm. longae, 6–10 mm. latae, utrinque furfuraceo-tomentellae, extra dimidio superiore vel apicem versus consociabus glandularum praeditae; bracteolae infra medium pedicellum similes sed breviores atque multo angustiores, plus minusve spathulato-lineares, 0.8–1.3 cm. longae, 2–3.5 mm. latae; pedicelli vulgo 3–5 mm. longi, imi nonnunquam ad 9 mm. longi. *Calyx* tubuloso-campanulatus, apicem versus quincostatus costis in denticulis excurrentibus, 1.1–1.6 cm. longus, apice 5–7 mm. latus, extra furfuraceo-tomentellis glandulis raris neque conspicuis. *Corolla* alba, membranacea, anguste infundibularis, scilicet emarcida formam hypocrateriformem praebens, 3–6 cm. longa, limbo expanso 2 (emarcido)–4 cm. diametro; tubus inferne longe anguste cylindricus, tum sensim ampliatus ac apice demum circiter 1 cm. latus sed statu emarcido multo angustior, extra omnino glaber, intus fere glaber sed hic illic sparse glanduloso-lepidotus praeterea 1 cm. supra basin zona conspicua pilorum longorum tenuium hyalino-nitentium 5 mm. longa praeditus; lobi papillis minutis utrinque furfuraceo-puberuli, circiter 1.5 cm. longi atque lati. *Stamina* glabra, tubo satis longe supra zonam pilorum inserta; longiora (antica) filamentis 3 cm. longis 2.2 cm. supra tubi basin insertis; breviora filamentis 2.4 cm. longis 2.5 cm. supra tubi basin insertis; antherae e corollae fauce conspicue exsertae, thecis divaricatis 2.5–3 mm. longis, connectivo haud conspicue producto sed gibbum brevem

latum obtusum tantum efformante ; staminodium mancum visum 3.5 mm. longum, forsan paulo longius. *Discus* magnus, pulvinari-cupularis, 1 mm. altus. *Ovarium* oblongum, 2.5–3 mm. longum, 1–1.2 mm. latum, dense minute lepidotum ; stylus stigmatibus inclusis 4.5–5 cm. longus, glaber ; ovula pro loculo biseriata, in quaque serie 11–12. *Capsula* linear-oblonga, in apicem obtusum attenuata, matura 20 cm. longa, 2 cm. lata, valvis satis lignosis glabris sed crebre longitudinaliter rugosulis ac arcte brunneo-lenticellatis, costa mediana tenuiter elevata ; semina 5.5–6 cm. lata, embryone crassa brunnea 1.3–1.5 cm. longa, alis membranaceis sordide cremeo-hyalinis inferne lineis brunneis percursis.

COLOMBIA. Cundinamarca : Hacienda El Cucharo, between Tocaima and Pubenza, c. 350 m., fl. May 1944, *E. P. Killip*, *A. Dugand* and *R. Jaramillo* 38326 (type in Kew Herb.), "plant 30–50 cm. high, erect (in potrero), becoming a vine, corolla white" ; Tocaima, fl. Dec. 1932, *Perez* 2497 ; near Fusagasuga, c. 1350 m., fl. Feb. 1876, *André* 1617, "sarmentos., subscandens, flores albi, pedunculi nigrescentes." Tolima : prov. de Mariquita, Paso de Opia, 300 m., fr. and seeds, July 1853, *Triana* 4124 (Herb. Mus. Brit.). Without locality or data, fls., *Herb. Triana* (Herb. Mus. Brit.). Without locality or data, fls., *Lehmann* no. K. 281.

An outstanding species of the group with leaflets drying lead-coloured except for the pale, thickened margins. The other members are *A. inundatum* Mart. ex DC., *A. marginatum* (Cham.) DC., *A. impressum* (Rusby) Sandw., *A. apurense* (H.B.K.) Sandw., *A. calderoni* (Standl.) Seibert (*A. hintoni* Sandw.), and *A. magdalenense* Dugand. This new Colombian species, of which all the specimens seen appear to come from the departments of Cundinamarca and Tolima, is at once distinguished by the long, many-flowered inflorescence with large bracts and narrow white corollas, with the tube glabrous outside and the anthers conspicuously exerted from the throat. Other features are the cordate base of the leaflets, the long stamens which are inserted at some distance above the villous zone within the corolla tube, the unusually long and thin hairs of that zone, the inconspicuously produced anther-connective, the long style, and the number (11–12) of ovules in each series. All the other species of this group have yellow corollas, only one other (*A. magdalenense*) has exerted anthers, and one other (*A. impressum*) a corolla tube with the outer surface glabrous. The latter species is very distinctive on account of its flexuous, recurved inflorescences and glabrous calyces.

This interesting plant is named in honour of Dr. A. Dugand, who collected the type specimen, and who has been singularly successful himself in recognizing and describing genuine new species of *Bignoniaceae*. The type specimen, which he presented to Kew, is a duplicate selected from material in the Herbario Nacional Colombiano, Bogotá.

Memora Miers. The taxonomy of this genus has scarcely been improved by the late Dr. A. J. Sampaio's paper —on his own admission, a provisional study—in *Anais de Primeira Reunião Sul-Americana de Botânica*, **3**, 149–170 (1938). Dr. Sampaio saw no European type specimens, or even photographs of them, and many of the characters used in his key and in his diagnoses of new species seem to be of very doubtful taxonomic

value. If such characters continue to be used, each collection of a Bignoniaceous climber will be proposed as a "new species", and interest in the family will inevitably be stifled until a strong and determined personality has the time and energy to prepare a new synthesis. *Memora duckei* Sampaio is surely conspecific with *M. flavida* (DC.) Bur. et K. Schum. *M. longilinea* Sampaio is evidently a near ally of *M. flaviflora* (Miq.) Pulle, but seems distinct on account of the shape and larger size of the leaflets and the shorter, truncate calyx which is not spathaceously split. I have seen no specimens of the other new species proposed by Dr. Sampaio.

Memora cladotricha Sandwith, sp. nov. ; *M. schomburgkii* (DC.) Miers atque *M. magnificae* (Mart.) Bur. affinis, ab ambabus indumento foliorum e pilis ramosis stellatiformibus constituto, praeterea bracteolis magnis calycem nonnunquam subaequantibus distinguitur.

Frutex, ramulis rhachi foliorum petiolulis foliolis necnon inflorescentiis indumento e pilis ramosis stellatiformibus saepe furfuraceis constituto praeditis ; pseudostipulae nullae visae. *Folia* summa tantum visa, simpliciter pinnata, 5-7-foliolata, ad 25 cm. longa ; petiolus 2-3 cm. longus, velut internodia rhacheos 3.3-5 cm. longa satis gracilis atque pilis supra commemoratis conspicue indutus ; petioluli laterales 0.6-1.1 cm. longi, petiolulus terminalis 2.2-3 cm. longus, similiter induti ; foliola anguste oblongo-elliptica vel fere oblanceolata, apice acuminata, basin versus attenuata sed basi ipsa plus minusve rotundata vel obtusa, 10-15 cm. longa, 2.4-3.4 cm. lata, chartacea, siccitate griseo-viridia subtus pallidiora, utrinque pilis ramosis satis sparsis sed numerosis induta, costa supra tenui subplana subtus prominente, nervis primariis utroque ejus latere circiter 6-7 sursum arcuatis velut venulis utrinque tenuibus sed subtus prominulis. *Inflorescentia* axillaris, 5-6 cm. longa, racemosa, densiflora, ubique pilis ramulosis furfuraceo-tomentella ; bractee delapsae ; pedicelli inferiores 5-9 mm. longi ; bracteolae supra medium pedicellum insertae, magnae, ovato-ellipticae, 1.4-2 cm. longae, ad 1.2 cm. latae, subcoriaceae, extra minute puberulae atque glandulis paucis patelliformibus praeditae. *Calyx* tubuloso-campanulatus, 2-2.5 cm. longus, ad 1.5 cm. latus, membranaceus, dimidio vel triente superiore plus minusve spathaceo-fissus vel bilobatus, extra furfuraceo-puberulus atque glandulis paucis patelliformibus praeditus. *Corolla* flava, nulla plane expansa visa, tota 5-5.7 cm. longa, infundibuliformis, extra glabra, tubo parte basali anguste cylindrica circiter 1.2 cm. longa tum ampliato et sub lobis ad 1.4 cm. lato intus zona pilorum papilliformium aliquantum sub insertione staminum praedito ; lobi circiter 1.5 cm. longi. *Stamina* circiter 1.4 cm. supra tubi basin inserta, glabra, antica longiora 2.7-2.8 cm., lateralia 2.1 cm. longa ; antherarum thecae divergentes, 4.5 mm. longae ; staminodium gracile, glabrum, 6 mm. longum. *Discus* pulvinatus, 1.5 mm. altus. *Ovarium* lineari-oblongum, 6.5 mm. longum, 1.3 mm. latum, hic illic impresso-glandulosum, secus zonas longitudinales minute verruculoso-lepidotum, ceterum glabrum ; stylus glaber, 3.5 cm. longus. *Fructus* non visus.

COLOMBIA. Meta : Sierra de la Macarena ; Rio Guapaya, in dense humid forest, 500 m., fl. January 18th, 1950, *Philipson* 2123 (type in Herb. Mus. Brit.). "Whippy shrub, bark white in patches. Flowers yellow."

This species is remarkable for the branched hairs on all parts of the leaves, and for the large bracteoles. In spite of the latter character, it is an obvious member of the section *Eumemora*, as understood by K. Schumann and, more recently, by A. J. Sampaio. The leaflets are narrower than those of all the specimens seen of *M. schomburgkii* and *M. magnifica*, which seem to be the closest allies. No fully open corolla was collected, and I was unable to count the ovules in the single ovary which I examined.

Memora patula Miers in Proc. Royal Hort. Soc. **4**, 161 (1864).—*M. caracasana* K. Schum. in Engl. et Prantl, Pflanzenfam. **4**, 3 B, 225 (1894) ; Bur. et K. Schum. in Mart. Fl. Bras. **8**, pars 2, 268 (1897). *M. romeroi* Dugand in Caldasia, **1**, no. 5, 29 (1942). *Adenocalymma anomalum* Pittier in Contr. U.S. Nat. Herb. **18**, 254 (1917) ?

Distr. Colombia, Venezuela.

I have compared the description and a photograph of the type of *M. romeroi* with Miers' description and with the Kew sheet of the type collection (coll. *Weir*) of *M. patula* from the Magdalena River, Colombia, and feel confident that these two species are conspecific. Many years ago, I borrowed the type specimen (in the Berlin Herbarium, and no doubt since destroyed) of *M. caracasana* and noted that it was "certainly near *M. patula* Miers. ? Conspecific." Unfortunately, a photograph was not taken. On re-reading Schumann's description of *M. caracasana*, and the notes I took when examining the type specimen, I do not believe that species can be distinguished from *M. patula* which varies, like other *Bignoniaceae*, in the length of the inflorescence, calyx and corolla (cf. also Dr. Dugand's excellent notes on the varying specimens referred by him to *M. romeroi*).

The important characters of *M. patula* (as including *M. romeroi*) seem to be the conspicuous and foliaceous, persistent, more or less spatulate bracteoles, and the very broad pale seeds with membranous hyaline borders to the wings. The second of these characters at once distinguishes this species from fruiting examples of *M. schomburgkii* (DC.) Miers, a common species of Guiana and the Amazonian regions, with much narrower trapeziform, wholly corky seeds which dry brown. Unfortunately, the presence (constant ?) of large bracteoles in *M. patula* is apparently not always a reliable diagnostic character, when only flowers are present, nor have I yet found any certain means of distinguishing flowering specimens of *M. patula* and *M. schomburgkii*, although the great majority of the herbarium examples of the latter bear very small inconspicuous bracteoles. Here is an interesting problem for investigation by field-workers and collectors, who can take flowers and fruits from the same plant.

M. patula not only grows in the Depts. of Magdalena and Atlántico in Colombia, but is apparently frequent in Venezuela : I have seen specimens from the States of Trujillo (*Pittier* 13334), Lara (*Saer* 157), Miranda (*Pittier* 5967 (New York), 11025) and Anzoátegui (*Steyermark* 61480). I strongly suspect, from the description, that the Venezuelan *Adenocalymma anomalum* Pittier is only a form of this species with unusually large bracteoles.

Memora peregrina (Miers) Sandwith, comb. nov.—*Pleonotoma peregrina* Miers in Proc. Roy. Hort. Soc. **3**, 183 (1863) ; Bur. et K. Schum. in

Mart. Fl. Bras. **8**, pars 2, 280 (1897). *Memora cuspidata* Hassl. in Fedde, Rept. Spp. Nov. **9**, 57 (1910) ; A. Sampaio in An. Prim. Reun. Sul-Amer. Bot. **3**, 161 (1940).

BRAZIL. São Paulo : without locality, fls. yellow, *Weir* 152 (type, Kew Herb., fragments in Hb. Mus. Brit.). Minas Gerais : Ituiutaba, bush from savannah at Fundad, fls. yellow, Feb. 1948, *A. Macêdo* 1020 (Kew Herb.).

PARAGUAY. Sierra de Amambay, coll. Rojas, *Hassler* 10735, 10735a (type collections of *M. cuspidata*, Kew Herb.) ; a shrub of campo.

Miers' species was unknown to Bureau and Schumann who placed it as a *species incertae sedis* at the end of *Pleonotoma*. Examination of the type collection shows that it has the branchlets and other characters of the genus *Memora*, and is the savannah shrub which was described as a new species from Paraguay by Hassler and has recently been collected in Minas Gerais by Dr. Amaro Macêdo. The species is well characterized, apart from its habit, by its glabrous racemes, the short narrow bracts and bracteoles, the spathaceous calyx without glands, and the funnelshaped tube of the corolla which is narrowed very gradually to the mouth of the calyx, showing no constriction. Miers described the corolla as *violacea*, but he evidently made a guess from the appearance of the dried specimen: there are no field notes with the two sheets of *Weir* 152 in the Kew Herbarium, but the fragments in Miers' own herbarium (now incorporated in Herb. Mus. Brit.) are accompanied by the legend, "large yellow flowers". Both Miers and Hassler described the plant as quite glabrous, but there is a distinctive short pubescence on the costa of the upper surface of the leaflets of all the material seen, and this extends down the upper side of the pinna or main rhachis. The pseudostipules are either small and foliaceous, or not evident. Sometimes, as on the type collection, the species shows a capacity to climb, bearing simple bifoliate leaves terminated by a simple tendril near the apex of the branchlets. Below these, the leaves may be either simply pinnate, as described by Miers, or variously bipinnate with 2-3 pinnae.

Chrysanthemums.*—This book presents in a convenient form all essential facts regarding the cultivation of Chrysanthemums. The author begins by giving some interesting information on the history of this popular flower, describing its early cultivation in Japan and some of the unusual types grown in that country. He then goes on to deal with propagation, soils, potting and watering, the preparation of exhibition plants, greenhouse cultivation, early flowering varieties and other types such as singles, Koreans, Pompons and Liliputs. There are also chapters on the classification of varieties, sports or mutations, chrysanthemums from seed, perfume, pests and diseases. The book ends with rules for exhibitors, judges and officials, and is illustrated with over 50 excellent photographs and a number of line drawings. This useful book will form an interesting addition to the library of many garden lovers.

H. S. MARSHALL.

* Chrysanthemums for garden and exhibition. By John Woolman. Pp. 112. W. H. & L. Collingridge Ltd., London and New York, 1953. Price 10/6d.

A NOTE ON THRYPTOMENE ENDL.

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In a paper entitled "Nomenclatural notes on Rafinesque's published papers 1804-40" Merrill (*Jour. Arn. Arb.* **29**, 202-214: 1948) mentions *Gomphotis* Raf. (1838) as synonymous with *Thryptomene* Endl. (1838) but states that he has made no special attempt to ascertain which of these is the valid name. Since *Thryptomene* is a genus including about 40 species only one of which has ever been associated with Rafinesque's name and since a proposal for conservation of Endlicher's name has already been made the matter is of some interest.

The points at issue are (1) which name has priority and (2) whether the two genera are, in fact, synonymous.

Rafinesque's description was published in "Sylva Telluriapa" in 1838 and was based on *Baeckea saxicola* A. Cunn. ex Hook. *Bot. Mag.* t. 3160. This species has had a somewhat checkered career since in addition to the above change it was transferred to *Astraea* Schauer non Klotzsch by Schauer in *Linnaea* **17**, 238-9 (1843) and then to *Thryptomene*, again by Schauer, in Lehmann's *Plantae Preissianae* (1844-45).

Thryptomene was published by Endlicher in *Annalen des Wiener Museums* Bd. 2.192 (1839). The date December 1838 appears on the title page of the article but according to a note attached to the copy of this journal in the Library at Kew, pages 1-324 were issued in 1839. It would appear, therefore, that Rafinesque's name definitely has priority unless Endlicher's paper appeared as a separate one on a date earlier than that of the "Sylva Telluriana".

Turning to the point of synonymy it is found that Rafinesque defines his genus thus:

"631. GOMPHOTIS R. (Club ear) diff. Beckea cal. 5 lobus coloratus, pet. 5, stam. 10 eq. ovar. concretum, stig. capit. caps. 5 loc.

632. *Gomphotis saxicola* R. Beckea do Hook. b.m. 3160, fol. oppos. imbric. obov. acutis, fl. axil. and term.—Australian shrub.

There being no evidence that Rafinesque ever actually saw a specimen of *Baeckea saxicola* one suspects, in view of his diagnosis, that his description was based wholly on the text given in the *Botanical Magazine*. For example, he states that the capsule is 5-locular, presumably following the generic description for *Baeckea* given as 2-5-locular by Hooker (l.c.) since there is no information on this point in the specific description. It may be added that in his description of *Beckea* (sic) Rafinesque writes "2-3-loc." On the other hand, Schauer in *Linnaea* **17**, 239, correctly gives the capsule as unilocular, a character which in itself justifies removal from *Baeckea*. This is a crucial point since Endlicher in defining *Thryptomene* writes "Ovarium inferum, uniloculare". Also the number of the loculi in the ovary and their dehiscence are basic to the separation of the tribes *Chamaelaucieae* and *Leptospermeae* to which *Thryptomene* and *Baeckea* respectively belong. Consequently if *Gomphotis* was accepted as synonymous with *Thryptomene* and Rafinesque's description taken in

full the resultant broadening of the generic character would also involve the circumscription of these tribes.

Thus the only relationship which can be established between the two genera is the fact that Rafinesque selected as his type a species which was later transferred to *Thryptomene* but which he failed to describe correctly. From his text it is clear that Rafinesque separated *Gomphotis* on the character of the capsule. Hence any attempt to revive his name must cause confusion when the type species fails to conform to the original description. Under these circumstances it is confidently expected that the proposal by Garden and Johnson in *Austral. Herb. News* No. 5, 3 (1949) and *Syn. Prop. Stockholm* No. 17, 229 (1950) to conserve *Thryptomene* will be accepted.

A Swiss Flora.*—Switzerland is botanically twice blessed, firstly in possessing an unusually varied and beautiful flora, and secondly in boasting an enviable succession of accomplished botanists, whose labours have displayed these vegetable riches to the world.

The present volume makes no pretensions to being a *magnum opus*, it is essentially a botanists' pocket book, but, as such, it is in the best traditions of Swiss botany and book production, and those of us who judge scientific literature by quality of content rather than by number of pages will agree that it fully meets the requirements of the intelligent botanist, especially if he has big ambitions and small pockets.

Within a very small compass keys and descriptions are given for seven hundred and seventeen genera and almost three thousand species, together with a brief but helpful introduction, a neat glossary of botanical terms, a key to families, a list of poisonous plants, an excellent index to families, genera and popular names, a map and three hundred and seventy six text figures. The alien element in the flora has not been overlooked, and the occurrence of hybrids is noted, even if details are withheld. Symbols are used to outline geographical distribution. Descriptions are of necessity a little brief, but careful choice of words helped out by the admirable economies of the French language, makes clarity possible where it would be impossible in English. Nomenclature is up-to-date, and we are mercifully spared those excesses of generic splitting which have marred recent European productions. Those of us who would like more in the way of illustration are advised to purchase "l'Atlas de poche de la flore suisse" by E. Thommen, an equally neat companion volume. With both of these in our pockets, we should set forth on our way rejoicing.

R. D. MEIKLE.

* *Flore de la Suisse*, by Auguste Binz and Edouard Thommen., 2nd Ed., pp. XXXVI + 450, tt. 41 + 376. F. Rouge & Cie S.A., Librairie de l'Université, Lausanne, 1953. Price Fr. 21.65.

REVISION OF THE "FLORA OF WEST TROPICAL AFRICA."—V.*

R. W. J. KEAY

OCHNACEAE

Lophira alata Banks ex Gaertn. f. in Gaertn. Fruct. **3** : 52, t. 188 (1805) ; Oliv., F.T.A. **1** : 173 (1868), pro parte ; Hutch. et Dalz., F.W.T.A. **1** : 195 (1927), pro parte.

L. africana Banks ex G. Don in Loud. Hort. Brit. 200 (1830), nom. illegit. ; G. Don, Gen. Syst. **1** : 814 (1831), excl. descr.

L. simplex G. Don, Gen. Syst. **1** : 814 (1831).

L. barteri Van Tiegh. in Journ. de Bot. **15** : 186 (1901), nom. provis.

L. macrophylla Van Tiegh. l.c. 186 (1901), nom. provis.

L. tholloni Van Tiegh. l.c. 187 (1901), nom. provis.

L. spatulata Van Tiegh. l.c. 187 (1901), nom. provis. pro parte, quoad spec. Mann 708.

L. procera A. Chev., Vég. Util. Afr. Trop. Fr. **5** : 154 (1909) ; Aubréville, Fl. For. C. Iv. **2** : 272, t. 223 (1936).

L. alata Banks ex Gaertn. f. var. *procera* (A. Chev.) Burtt Davy in Chalk et Burtt Davy, For. Trees & Timbers Brit. Emp. **2** : 78, t. 16 (1933).

Type :—Sierra Leone, *Smeathmann* (BM, isotype !)

Lophira alata Banks ex Gaertn. f. was based on a specimen from tropical Africa, which Gaertner received from De Candolle, bearing the ms. name *Lophira alata* Banks. In the Herbarium of the British Museum there are two specimens of *Lophira* which Banks evidently saw and which were collected early enough to have been described by Gaertner. One of these, collected by Smeathmann, bears the ms. name *Lophira alata* and agrees very well with Gaertner's description and figure, especially in shape of the leaves and in the length of the fruit. The other specimen, collected by Afzelius, bears the same ms. name followed by question marks ; it does not agree completely with Gaertner's description. It is likely that Banks sent a duplicate of the Smeathmann specimen to De Candolle and that it was a part of this which Gaertner described. This is confirmed by reference to Alphonso De Candolle's work in DC. Prod. **16**, **2** : 638 (1868) where he indicates that he saw the Smeathmann specimen and took this to be the type of Gaertner's species. It seems, therefore, evident that the type of *Lophira alata* is the Smeathmann specimen. Now this specimen, as the description indicates, is the rain forest plant widely known today as *L. procera* A. Chev., the most recent of the 9 names which have been published in the genus.

Unfortunately when Chevalier (1909) recognised, correctly as I believe, that there are two species of *Lophira*, he failed to notice that Don had recognised the same fact in 1831, he ignored all Van Tieghem's names, and he did not ascertain the exact identity of the original *L. alata*. Don also failed to typify *L. alata* correctly, and so we now find that the savannah species which has long been regarded as typical *L. alata* is without a valid name.

* Continued from K.B. 1953, 291 (1953).

Van Tieghem's five new names are to be regarded as only provisional names since he stated that he did not know whether he was dealing with species, varieties or simply individual variations. It appears therefore necessary to validate one of his names for the well known savannah species, thus :—

Lophira lanceolata *Van Tiegh. ex Keay* sp. nov., arbor savannarum affinis *L. alatae* Banks ex Gaertn. f., sed foliis maturis anguste oblongis vel oblanceolatis, longitudine quam latitudine minime quadruplo longioribus, petiolis 1·5–6·5 cm. longis, foliis plantarum juvenilium necnon surculorum semper valde petiolatis differt.

L. lanceolata Van Tiegh. in Journ. de Bot. **15** : 187 (1901), nom. provis.

L. spatulata Van Tiegh. l.c. 187 (1901), nom. provis., pro parte, quoad spec. Barter 1167.

[*L. africana* (non Banks ex G. Don)—G. Don, Gen. Syst. **1** : 814 (1831), pro parte, quoad descr.]

[*L. alata* (non Banks ex Gaertn. f.)—Oliv., F.T.A. **1** : 173 (1868), pro parte ; Hutch. et Dalz., F.W.T.A. **1** : 195 (1927), pro parte ; Chalk et Burt Davy, For. Trees & Timbers Brit. Emp. **2** : 76 (1933), pro parte, quoad descr. ; Aubréville, Fl. For. C. Iv. **2** : 269 (1936) ; Aubréville, Fl. For. Soud.-Guin. 80, t. 13 (1950).]

Type :—French Guinea, Kebali, *Maclaud* 443 (P. holotype !).

MIMOSACEAE

Newtonia duparquetiana (Baill.) *Keay* comb. nov.

Entada ? *duparquetiana* Baill. in *Adansonia* **6** : 210 (1866).

Newtonia insignis Baill. in Bull. Soc. Linn. Paris **1** : 721 (1881).

Piptadenia insignis (Baill.) Bak. f., Leg. Trop. Afr. **3** : 792 (1930).

Piptadenia duparquetiana (Baill.) Pellegr. in Bull. Soc. Bot. Fr. **94** : 101 (1947).

Type :—Gabon, *Duparquet* 12 (P).

Newtonia elliotii (Harms) *Keay* comb. nov.

Piptadenia ? *elliotii* Harms in Engl. Bot. Jahrb. **26** : 260 (1899).

Type :—Sierra Leone, *Scott Elliot* 4792 ; 5660 (B ; K, syntypes !).

Newtonia aubrevillei (Pellegr.) *Keay* comb. nov.

Piptadenia aubrevillei Pellegr. in Bull. Soc. Bot. Fr. **80** : 466 (1933).

Type :—Ivory Coast, *Aubréville* 600 ; 861 (P ; K, syntypes !).

Samanea dinklagei (Harms) *Keay* comb. nov.

Mimosa dinklagei Harms in Engl. Bot. Jahrb. **26** : 253 (1899).

Albizzia dinklagei (Harms) Harms in Engl. Bot. Jahrb. **53** : 455 (1915).

Pithecellobium dinklagei (Harms) Harms in Notizbl. Bot. Gart. Berl. **8** : 145 (1918).

Cathormion dinklagei (Harms) Hutch. et Dandy in F.W.T.A. **1** : 364 (1928) ; Kew Bull. 1928 : 401.

Type :—Liberia, *Dinklage* 1827 (B ; K, isotype !).

Ample material of this species is now available from Portuguese Guinea, French Guinea, Sierra Leone, Liberia, Ivory Coast and Gold Coast. The fruit is now known to be more or less straight, subwoody, indehiscent and not jointed. The description of the fruit in the F.W.T.A. **1** : 364 (1928) was evidently based on a specimen from the French Cameroons (*Mildbraed* 8584), since at that time no fruit was available from within the area of the Flora. The material now available makes it clear that two species, or rather genera, are involved despite the remarkable resemblance of the foliage and flowers.

The material from Portuguese Guinea to Gold Coast is clearly that originally described as *Mimosa dinklagei* Harms, but the indehiscent subwoody pod excludes the species from all four genera into which it has been placed at one time or another. It can only stay in *Pithecellobium*, as suggested latterly by Harms, by E. G. Baker (Leg. Trop. Afr. **3** : 871) and by Aubréville (Fl. For. C. Iv. **1** : 176), if the broad, "dumping-ground" view of *Pithecellobium* is adopted. If this broad view adopted by Bentham is maintained it seems illogical to keep *Pithecellobium*, *Enterolobium*, *Calliandra* etc. separate from *Albizzia*. It does appear however that fruit characters are of generic importance in this group, and, following the present day classification, this plant seems most at home in *Samanea* (Benth.) Merrill. I would point out however that *S. dinklagei* has a very strong resemblance to the American *Enterolobium schomburgkii* Benth., except for the curved pod which is the leading character of the genus *Enterolobium*.

The material from the French Cameroons, Ubangi-Shari and Belgian Congo which has been confused with *S. dinklagei* appears to be *Albizzia leptophylla* Harms, which, on account of its jointed pod, is clearly a *Cathormion*. Gilbert and Boutique in Fl. Congo Belge **3** : 192 (1952) point this out, but adopt the generic name *Arthrosamanea* Britton et Rose which can scarcely be separated from *Cathormion* Hassk. A new combination is therefore needed :—

Cathormion leptophylla (Harms) Keay comb. nov.

Albizzia leptophylla Harms in Engl. Bot. Jahrb. **53** : 455 (1915).

Arthrosamanea leptophylla (Harms) Gilbert et Boutique in Bull. Jard. Bot. Brux. **22** : 182 (1952).

Type :—Belgian Congo, *Mildbraed* 3520 (B).

Cathormion rhombifolium (Benth.) Keay comb. nov.

Albizzia rhombifolia Benth. in Hook. Lond. Journ. Bot. **3** : 87 (1844).

[*Albizzia glaberrima* (non (Schum. et Thonn.) Benth.)—Hutch. et Dalz. F.W.T.A. **1** : 362 (1928), pro parte, excl. syn. *Mimosa glaberrima* Schum. et Thonn.]

[*Pithecellobium glaberrimum* (non (Schum. et Thonn.) Aubrév.) — Aubrév. in Not. Syst. **14** : 57 (1950), pro parte, quoad nota.]

Type : French Guinea, *Heudelot* 735 (K, holotype !).

In 1844 Bentham described *Albizzia rhombifolia* as a new species distinct from *Albizzia glaberrima* (Schum. et Thonn.) Benth., the new combination for which he made in the same paper, based on *Mimosa*

glaberrima Schum. et Thonn. Later however he saw Thonning's specimen and in his monograph (Trans. Linn. Soc. **30** : 563 (1875)) united the two species under the name *A. rhombifolia*. Hutchinson and Dalziel accepted Bentham's taxonomical conclusions, but, following modern rules of nomenclature, adopted the earlier name *A. glaberrima* (Schum. et Thonn.) Benth.

I have, however, recently been able to examine Thonning's specimen on loan at Kew through the courtesy of Prof. Hagerup of Copenhagen. It is perfectly clear from this that *Mimosa glaberrima* Schum. et Thonn. is quite distinct from *Albizzia rhombifolia* Benth., and is in fact identical with *Albizzia warnecke* Harms described from Togoland, and almost certainly conspecific with *Albizzia glabrescens* Oliv. described from E. Africa.

Aubréville (l.c.) has pointed out that the plant previously known wrongly as "*Albizzia glaberrima*" (i.e. *Albizzia rhombifolia* Benth.), has jointed fruits which exclude it from the genus *Albizzia*, and he made a new combination under *Pithecellobium* using the misapplied trivial "*glaberrima*". I prefer, however, to take a narrower view of the genera of the *Pithecellobium* group and have therefore made the combination for *Albizzia rhombifolia* under *Cathormion*.

C. rhombifolium is known from Senegal (Casamance), Portuguese Guinea, French Guinea and Sierra Leone and is a small tree (to 10 m. high) of swamp forest.

The synonymy of the true *A. glaberrima* which is widespread in tropical Africa is therefore as follows :—

Albizzia glaberrima (Schum. et Thonn.) Benth. in Hook. Lond. Journ. Bot. **3** : 88 (1844) ; Oliv. F.T.A. **2** : 358 (1871).

Mimosa glaberrima Schum. et Thonn., Beskr. Pl. Guin. 321 (1827).

Pithecellobium glaberrimum (Schum. et Thonn.) Aubrév. in Not. Syst. **14** : 57 (1950), pro parte, quoad syn., excl. nota.

Albizzia glabrescens Oliv., F.T.A. **2** : 357 (1871).

Albizzia warnecke Harms in Engl. Bot. Jahrb. **30** : 75 (1901).

Type :—Gold Coast, *Thonning* s.n. (C, holotype !).

CAESALPINIACEAE

Schotia africana (Baill.) Keay comb. nov.

Humboldtia africana Baill., Hist. Pl. **2** : 99 (1870).

Schotia humboldtioides Oliv., F.T.A. **2** : 310 (1871).

Theodora africana (Baill.) Taub. in Engl. et Prantl Pflanzenfam. **3, 3** : 138 (1892).

Baillon (l.c.) does not cite a specimen, and so his description is presumably to be taken as the type of his *Humboldtia africana* and is a year earlier than *Schotia humboldtioides* Oliv.

Macrolobium explicans (Baill.) Keay comb. nov.

Vouapa explicans Baill. in Adansonia **6** : 181 (7 Oct. 1865).

Macrolobium heudelotii Planch. ex Benth. in Trans. Linn. Soc. **25** : 308 (after 2 Nov. 1865).

Type :—French Guinea, *Heudelot* 738 (P, holotype ; K, isotype !).

The minutes of the Council of the Linnean Society record that the price was fixed at the Council meeting on 2 Nov. 1865 for Volume 25, part 2 of the Transactions, which was reported at the meeting as being ready for distribution. The date of publication for *Macrolobium heudelotii* is therefore later than for *Vouapa explicans* Baill. by at least 26 days. *Heudelot* 738 is the type number cited for both names.

Daniellia J. J. Benn.

Two "species" and one "variety" of this genus have been found to be based on mixed specimens. Fortunately there is an earlier valid name for each component of the mixtures. They are :—

Daniellia caudata Craib ex Holl. in Kew Bull. Add. Ser. **9** : 268 (1911).

The type of this species (*Unwin* 179, in Hb. Kew.) consists of a leafy shoot of *Clitandra barteri* Stapf (Apocynaceae) and detached flowers of *Daniellia ogea* (Harms) Rolfe ex Holl. There are in the Kew Herbarium several specimens of the *Clitandra* collected by Unwin and it is likely that an error in mounting led to a leafy shoot of the *Clitandra* being associated with the flowers of the *Daniellia*.

Daniellia punchii Craib ex Holl. l.c. 269 (1911).

The type of this species (*Punch* 115, in Hb. Kew.) consists of a leafy shoot of *Crudia* (probably *C. senegalensis* Planch. ex Benth.) and detached flowers and fruits of *Daniellia ogea* (Harms) Rolfe ex Holl. There is another specimen in the Kew Herbarium of *Crudia* collected by Punch and it is quite clear that the leafy shoot, now part of the type of *Daniellia punchii*, originally came from this specimen.

Daniellia thurifera J. J. Benn. var. **chevalieri** J. Léonard in Bull. Jard. Bot. Brux. **19** : 407, t. 39 (1949).

The type of this variety is *Chevalier* 2969 from Koulaye-Kouraye in Senegal (Casamance). The specimens seen by Léonard, as well as the duplicate at Kew which I have studied, have distinctly pubescent leaves which are almost certainly of *Daniellia oliveri* (Rolfe) Hutch. et Dalz. *Chevalier* collected on the same day (17 Feb. 1900), at the village of Koulaye-Kouraye, No. 2968, a savannah tree which he named *D. thurifera* J. J. Benn., and No. 2969, a tall forest tree which he called *D. oblonga* Oliv. He described (see Guignard in Journ. de Bot. **16** : 76–78 (1902)) the leaves of the tall tree as entirely glabrous.

Now the flowers of *Chevalier* 2969 are evidently of *D. ogea* (Harms) Rolfe ex Holl. (= *D. oblonga* of *Chevalier* and of *Guignard*) but they have become associated with the leaves of *D. oliveri* (— *D. thurifera* of *Chevalier* and of *Guignard*) which were presumably collected originally as *Chevalier* 2968. In the herbarium of the British Museum there is a duplicate of *Chevalier* 2968 consisting of only flowers which are undoubtedly *D. oliveri*.

In addition to the flowers and fruits of the above mixtures two other species of *Daniellia* should, I consider, be referred to *D. ogea* which now has the following synonymy :—

Daniellia ogea (Harms) Rolfe ex Holl. in Kew. Bull. Add. Ser. **9** : 268 (1911).

Cyanothyrsus ogea Harms in Engl. Bot. Jahrb. **26** : 270 (1899).

Daniellia caudata Craib ex Holl. l.c. 268 (1911), pro parte, excl. folia (= *Clitandra barteri* Stapf).

D. punchii Craib ex Holl. l.c. 269 (1911), pro parte, excl. folia (= *Crudia* sp.).

D. fosteri Craib ex Holl. l.c. 268 (1911).

D. similis Craib ex Holl. l.c. 269 (1911).

D. thurifera J. J. Benn. var. *chevalieri* J. Léonard in Bull. Jard. Bot. Brux. **19** : 407 (1949), pro parte, excl. folia (= *D. oliveri* (Rolfe) Hutch. et Dalz.).

Type :—Nigeria, Millen 191 (K, holotype!).

Conifers in Britain.*—Mr. Jay's book on "Conifers in Britain" is described on the title page as "an illustrated guide to identification". The illustrations in fact form the main body of the work since there are 136 full page plates and only 47 pages of text.

The author has not attempted to include every conifer grown in Britain but only such as are commonly found in forests or gardens. An exception has been made in the case of *Ginkgo biloba* while *Metasequoia glyptostroboides*, also included, is only to be found in gardens at present as a very young tree. It is perhaps surprising to find that this plant, known only as a fossil before 1945, possesses a "common name", that of "Dawn Redwood".

The text of the book consists largely of generic and specific keys. The photographic illustrations are excellent, both in the execution of the originals, all taken by the author, and in the preparation of the blocks. In most cases, in addition to a life-size photograph of each species, a magnified portion of a branch is also provided. The magnification has been standardised at 8 diameters. In some cases this has produced an almost zoological effect, the figure of *Abies pinsapo* (pl. 79) looking strangely like the forepart of some monstrous millepede. In general, however, these magnified illustrations should prove of great value; the definition is excellent and the stomatal lines on the leaves of *Picea* and *Abies*, for example, stand out with astonishing clarity.

The keys are clear and workable and in conjunction with the illustrations provide a most excellent means of identifying all but the less common species of conifers found in Britain.

For a book containing so many half-tone plates the price of the book is by no means excessive and both the author and the publishers are to be congratulated on producing a work which no serious student of British conifers can afford to ignore.

F. BALLARD.

* Conifers in Britain : by B. Alwyn Jay, M.A.For. (Cantab.), F.L.S., A.R.P.S., pp. 47 + 136 plates. London : Adam & Charles Black Limited. 1952. Price 35/- net.

A MALAYAN BLOW-PIPE BAMBOO.

R. E. HOLTUM.

In 1893 Leonard Wray sent to Kew flowering specimens of a bamboo which he had collected on Gunong Inas in Perak, at an altitude of 4500–6000 feet. This bamboo had slender internodes up to seven feet in length, and was much sought by forest peoples for making blow-pipes. Wray reported on the making of these blow-pipes in *Perak Museum Notes*, Vol. I, p. 54 (1894). He stated that the bamboo only occurred near the sources of the Selama and Plus rivers. The flowering specimens were studied at Kew by Stapf, who described the species as *Bambusa wrayi*, in *Kew Bulletin*, 1893, p. 14. Since that time, no other specimens of *Bambusa wrayi* have been seen by botanists.

In Skeat and Blagden's *Pagan Races of the Malay Peninsula*, Vol. I, p. 255, there is a footnote recording a statement by Wray that *Bambusa wrayi* was only used by peoples of the Plus district of Perak, and that "in other districts of Perak another species is used, of a kind not yet determined, with internodes 3–4 feet in length". Skeat and Blagden describe blow-pipes made by different peoples in several parts of Malaya from bamboos having internodes of such a length that two are needed for one blow-pipe. They describe how the two internodes forming the inner tube of the blow-pipe are joined together by Semang tribes (p. 281). It seems that with careful joining quite satisfactory blow-pipes can be made in this way. The Jakuns of Pahang however (p. 323) were reported as making inferior blow-pipes of two internodes of a bamboo called Buluh sēmēliang. Burkill (*Dictionary*, Vol. I, p. 293) infers that all blow-pipes made of two internodes are inferior, but I think Skeat and Blagden's meaning is that the inferiority was in the workmanship of the Pahang Jakuns in question. Burkill also records the name Buluh sēmēliang as used for bamboos of the species *Dendrocalamus giganteus* and *Gigantochloa verticillata*, and appears to infer that these species are used in making blow-pipes; but these bamboos are very large, have internodes of much less than three feet long, and would be quite unsuitable for making blow-pipes. Malay names for bamboos are, in my experience, often used differently in different localities; and botanical identifications of Malayan bamboo specimens have also been very doubtful.

Some years ago I began a survey of Malayan bamboos, attempting to correlate vegetative and flower characters, so that non-flowering plants could be identified. In 1948 I made a special journey to the Cameron Highlands district, partly in the hope of finding information about blow-pipe bamboos. I spent a week collecting such bamboos as were accessible from the Tapah-Cameron Highlands road, and had the help of two local Malays who had a good knowledge of the useful species; some of these species were extensively used for making large baskets for transport of vegetables from the Highlands. In the forest near the road about the 8th mile from Tapah (alt. 500 ft.) I was shown a bamboo which the Malays called Buluh sumpitan and declared to be the kind commonly used in that region for making blow-pipes. A Sakai man living not far away confirmed the statement, and showed me his blow-pipe made from such a bamboo. The longest internode which I saw was 125 cm. (51 inches) long, and the blow-pipe was made from two internodes; I was

told that blow-pipes were usually made in this way. I enquired of these people whether they knew of a bamboo which had internodes long enough for a blow-pipe to be made from one of them, and they replied that they did not know of such a bamboo.

When I examined the Buluh sumpitan at the 8th mile on the Cameron Highlands road, I recognized that it was identical with a bamboo which had long been in cultivation in the Botanic Gardens, Singapore. The origin of this plant is unrecorded, and it has never been known to flower; it has certainly been in Singapore for more than 30 years, probably more than 40 years.

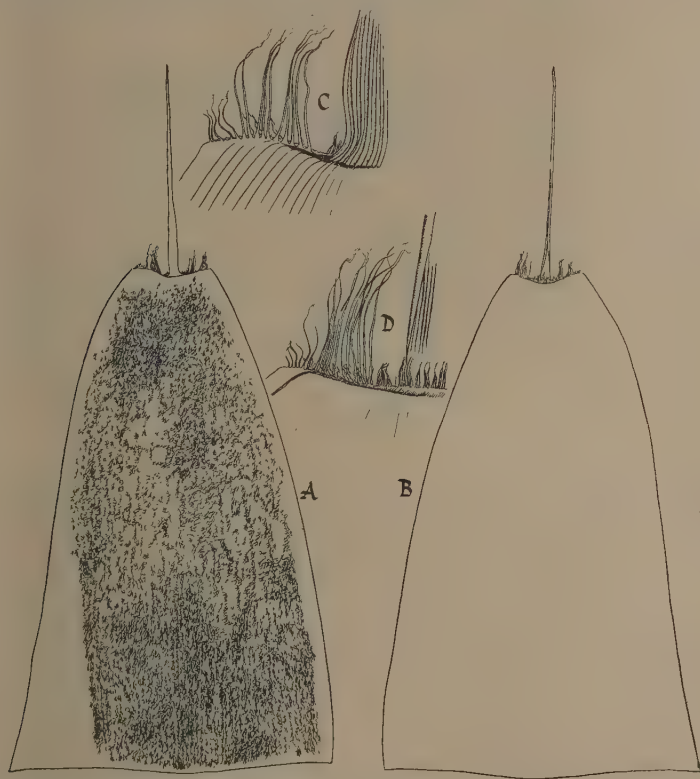
From Tapah I went to Teluk Anson, where Mr. E. F. Allen took me to the forest near the reservoir at Changkat Jong. In this forest I found the same bamboo, which the local Malays called Buluh kasap. According to Wilkinson, kasap means rough to the touch, and as applied to the bamboo it was said by the Teluk Anson Malays to refer to the loose hairs on the culm-sheaths. Most bamboos would on that count qualify for the name Buluh kasap, and I am not sure that it is always used for this species. Strangely enough, I found the same species also in the village of Buloh Kasap in Johore, on the stream bank close to the main road. I have also seen it near Kota Tinggi in S.E. Johore, near a stream, where it had doubtless been planted.

In 1950 Dr. Ivan Polunin brought to Singapore living plants of a bamboo used for making blow-pipes at Ulu Langat, Selangor. The plants were taken from a clump growing near an aboriginal settlement; Dr. Polunin thought the clump had probably been planted. The plants brought to Singapore grew successfully in the garden of the Botany Department of the University of Malaya, and proved to be the same species as that used near Tapah for making blow-pipes. I have seen no other bamboo in Malaya which has internodes of such a length, and I think it probable that this is the species generally used for making blow-pipes in the lowlands of Malaya.

On June 27th, 1953, I saw the same bamboo again at Kepong (Selangor) near the Forest Research Institute, and noticed one clump in flower. It is now therefore possible to describe the species botanically, and to name it. In the following description and in the accompanying drawings I have attempted to characterize clearly the peculiar culm-sheaths, which are very distinctive, and which, with the long internodes, enable one to recognize this bamboo easily. I have given the species name *jaculans* in reference to the fact that this bamboo is commonly used to hurl darts.

Schizostachyum jaculans *Holttum*, sp. nov. Culmi graciles, c. 6-7 cm. longi, ad 3.5 cm. diametientes; internodia vulgo 80 cm., interdum 125 cm. longa, apicem versus cere alba pruinosa, pilisque pallidis appressis restricte ornata. Vaginae culmorum ad 30 cm. longae, dorso pilis crassis laxis brunneis vestitae (pilis apicem vaginae versus pallidioribus); laminae vaginarum primo erectae, mox reflexae, angustae, longe acuminatae, 10-25 cm. longae, 7-18 mm. latae, supra prope basin leviter hirsutae, cetera glabrae; auriculae haud 1 mm. altae, ad 17 mm. latae, margine setis flexuosis pallidis 10-12 mm. longis vestitae; ligula haud 2 mm. alta, margine fimbriata (fimbriae ad 3 mm. longae). Folia

12-30 cm. longa, 1.2-5 cm. lata, infra breviter et molliter pilosa, supra glabra ; petioli foliorum infimorum 3-4 mm. longi, foliorum superiorum 5-7 mm. longi ; auriculæ vulgo setas tenues (interdum 10 mm. longas) ferentes ; ligula parva. Ramuli floriferi tenues, glabri, spicula fasciata ferentes ; internodia inferiora c. 4 cm. longa, superiora haud 1 cm. longa. Spicula glabra, tenuia, uniflora ; bracteae steriles ad 6 mm. longae, mucronatae, glabrae ; rachilla supra florem nulla ; lemma c. 10 mm. longum ; palea c. 16 mm. longa, apice setas duas 0.5 mm. longas ferens, dorso haud sulcata ; lodiculæ nullae ; stamina 6, anthera 6-6.5 mm. longa, filamenta immatura in tubo 0.5 mm. longo juncta ; ovarium cum stylo floescens c. 18 mm. longum ; stigmata 3, purpurea, patentia, hirsuta, 1.5 mm. longa ; fructus ignotus.



Culm-sheath of *Schizostachyum jaculans*. a, outer surface of a complete sheath, the blade moved to an erect position $\times \frac{1}{3}$. b, inner view of the same, showing ligule (vertically shaded) $\times \frac{1}{3}$. c, outer surface of part of top of sheath, showing auricle bearing bristles with the ligule behind it, and part of the base of the blade $\times \frac{4}{3}$. d, inner surface of parts shown in c ; the ligule is obliquely shaded, $\frac{4}{3}$.

TYPE : Kepong, Selangor, no. Kep. 71511, leg. J. Wyatt-Smith.

The flowers of this species are very similar to those of *Neohouzeaua mekongensis* A. Camus ; the only clear distinction is that the spikelets of *Schizostachyum jaculans* are shorter. The vegetative characters of *N. mekongensis* were not described.

Gamble discussed the genus *Neohouzeaua* and its relationships to the genera *Schizostachyum* and *Teinostachyum* in Kew Bulletin 1923, p. 92 ; he also added two more species to *Neohouzeaua*.

As originally described, *Neohouzeaua* appeared to differ from *Schizostachyum* in the following characters : no continuation of the rachilla beyond the fertile floret, no lodicules present, filaments joined to form a tube. But when one adds the species admitted by Gamble (which are certainly all closely related to the original one) all these differences disappear except the existence of the filament-tube. *N. dullooa* (Gamble) A. Camus and *N. helferi* (Munro) Gamble sometimes have a rachilla-continuation : *N. tavoyana* Gamble sometimes has two lodicules. *Schizostachyum blumei* Nees and other species admitted as *Schizostachyum* by Gamble, have no lodicules.

As pointed out by me in Journ. Arnold Arb., Vol. 27, p. 341, the presence or absence of a filament-tube in bamboos does not appear to be a satisfactory generic distinction, and I have there suggested that the genus *Neohouzeaua* should be included in *Schizostachyum*. A study of the present species has done nothing to change that opinion.

At the same time it is clear that we have here a closely related group of species, all having rather long slender internodes. Those of *N. dullooa* are 16-40 inches long, of *N. tavoyana* 14-15 inches (the culms only 1.5 cm. diameter), of *N. helferi* to 32 inches ; those of *N. mekongensis* were not described. The culm-sheaths of *N. dullooa* are the only ones described ; they are very similar to those of *Schizostachyum jaculans*. There is no report of the use of any of these other bamboos for making blow-pipes.

British Lichens.*—This census, compiled over a period of 30 years by England's veteran lichenologist, lists from the British Isles 1467 species of lichens, of which only 900 are recorded from Ireland, 66 of these from Ireland only. Clearly, though much remains to be done in completing the survey, the distribution of British lichens is much more fully understood than that of fungi. The present catalogue, however, suffers from the usual weakness that it contains no apparatus by which one can discover the source of the record for any particular vice county or check its reliability. The author has done so as far as possible and has indicated records he believes to be unreliable but it is not clear that one can regard all the remainder as personally verified or which of them are based on specimens seen and which on published records. It is to be hoped that collectors who are able to extend the recorded range of any but the commonest species will take the precaution of depositing voucher specimens in some major museum or herbarium where they will be available for verification when the census comes to be revised. 31 new combinations are listed separately, with their basonyms, on pp. viii and ix of the preface.

30th September, 1953.

R. W. G. DENNIS.

* Census Catalogue of British Lichens. W. Watson. PP. xx + 91. Cambridge University Press. 1953. Price 7/6.

ON THE DISCOVERY OF A MICROSPORE OF WELWITSCHIA IN EOCENE BEDS IN WESTERN KAZAKHSTAN.

A. A. CHIGURYAYEVA

(transl. H. K. AIRY SHAW).

(From *Bot. Zhurn.* **36**, 515–6 : 1951).

Fossil remains of *Welwitschia*—that in many respects so puzzling relict denizen of the Namib desert of South-West Africa—have not hitherto been known.

Whilst studying spores from Tertiary beds in Western Kazakhstan, I discovered a microspore (pollen grain) of *Welwitschia* in a specimen of combustible schist [? = oil-shale] from a section on the right bank of the river Syr-darya, 2.5 km. to the east of the station of Bai-khozha, on the Orenburg railway.

The age of the schists at Bai-khozha has been determined by V. L. Yakhimovich as Oligocene, by A. L. Yanshin and others as Eocene. On the basis of the microspore complex established by me for Bai-khozha, and a comparison of it with complexes from the Oligocene, Eocene and Palaeocene from Western Kazakhstan, the Don, the Ukraine and the Trans-Volga region, one may provisionally regard the beds in question as Eocene, or in any case as not later than Lower Oligocene. The absence of standard complexes for the region in question and the unusual character of the Bai-khozha complex render a more exact determination of age difficult.

The microspores of the present-day *Welwitschia* have been described by a number of authors (Kozo-Polyansky, 1945 ; Pokrovskaya, 1950 ; Chiguryayeva, 1949 ; Wodehouse, 1935 ; Erdtman, 1943, etc.).

The microspores of *Welwitschia* are very characteristic, and it is almost impossible to make a mistake in their identification. The fossil microspore of *Welwitschia* (fig. 1) discovered by me is similar in many respects to the microspores of the present-day *Welwitschia* (*W. bainesii*) (fig. 2).*

Elliptic in outline, 53.2 μ long, about 23 μ broad. Texture of the exine smooth, thick, coarse. Exine provided with the longitudinal ribs characteristic of the pollen of *Welwitschia*, alternating with grooves. At the end of the grain are situated two flat wing-like outgrowths, which are thickenings of the exine. We have found similar wing-like outgrowths also on the microspores of the present-day *Welwitschia* (fig. 2). Furrow not evident.

Besides the microspore of *Welwitschia*, we discovered in the same section microspores of *Ephedra*, *Pinus* sp., *Araliaceae* ? (*Tetraplasandra* type), *Myrtaceae*, *Euphorbiaceae*, *Polygonaceae*, *Santalaceae*, *Ericaceae*, *Sapotaceae*, *Umbelliferae*, *Leguminosae*, and many other forms not yet identified.

The discovery of *Welwitschia* and its xerophilous associates points to the presence in the Eocene of a *Welwitschia* flora on the site of the present-day Turanian deserts, and to the extension of this flora far to the east of its present-day refuge—the eastern† [sic !] shores of Africa.

* Magnification of microspores about $\times 600$.

† This is of course an orthographic error. *Welwitschia bainesii* (Hook. f.) Carr. is confined to a narrow strip of the Namib Desert stretching northwards from Sandfish Bay (23½°S) and continuing along the low coastal plain of Angola to a point a little south of Mossamedes (15½°S).—A.A.B.

It would seem that we have before us the fragments of an original pre-Tertiary desert flora, the commencement of the development of which, according to the hypothesis of M. G. Popov (1937), is to be referred to the Cretaceous and possibly even to the Jurassic period.

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A criticism of Chiguryayeva's identification of a fossil microspore referred to *Welwitschia*.

A. A. BULLOCK.

The discovery in a sample of fossil pollen from western Kazakhstan of a microspore alleged to be of a species of *Welwitschia* is of the greatest interest to students of plant geography; it is therefore necessary to examine in some detail the basis of the identification. It will be noted that in the text Chiguryayeva invariably uses the singular "microspore" in reference to the fossil. It is difficult to believe that she can have based her identification on a single microspore, but the text clearly indicates that only a single specimen was found. It is further remarkable that Chiguryayeva has not made clear the source of the recent *Welwitschia bainesii* microspores with which she compares her fossil specimen, or whether the comparison is based upon published descriptions and illustrations. The literature cited does not include the classical work of Sir J. D. Hooker which included a figure and description of the microspore (in *Trans. Linn. Soc.* **24** : 22, t. 6, f. 13 : 1863).

Chiguryayeva had the advantage of actually seeing her specimen(s) when she drew up her description of the fossil microspore; her illustrative photographs have suffered considerably in reproduction—possibly on account of the poor quality paper—but one must assume that they bear some resemblance to the originals. The "longitudinal ribs characteristic of *Welwitschia*" are certainly characteristic of that genus, but the illustration of the fossil shows ribs of an entirely different kind which look more like artefactual wrinkling than a feature of a living plant. Much more characteristic of *Welwitschia* is the broad longitudinal germinal furrow described by Hooker and all subsequent authors; there is no sign of this in the illustration and in her text Chiguryayeva dismisses it with the

phrase "Furrow not evident".* Allowing for possible specific differences one is inclined to ask what are the "many respects" in which the fossil microspore is similar to those of *Welwitschia bainesii*? The flat wing-like outgrowths of the fossil show some resemblance at one end of the grain but less at the other.

The identification must remain open to grave doubt, and Chiguryayeva's further conclusions are of still more doubtful validity. In the same deposits she claims to have identified pollen of various plant families which she regards as "xerophilous associates" of the alleged *Welwitschia* and hence postulates the former existence of a desert vegetation on the site of the present Turanian deserts. Whilst the families mentioned† do include xerophilous species among their recent members, none of them, with the possible exception of *Ephedra*, can be said to be entirely or even mainly xerophilous in the sense of desert plants; it would seem that Chiguryayeva's assumption that they represent the "xerophilous associates" of *Welwitschia* (sp.) is based on the assumed existence of the *Welwitschia* in that place at that time—a truly circular argument.

The Persian Cyclamen.‡—Bright colours, graceful form, scent, time and length of flowering period, and relative ease of cultivation combine to make *Cyclamen persicum* Mill. one of the most popular of house-plants, and the valued asset of many nurserymen. Professor Blasdale (Professor of Chemistry, Emeritus University of California) evidently finds *Cyclamen*-growing a pleasant pastime, and his enthusiasm pervades this readable, informative little book.

Brief essays on the history, taxonomy, morphology, physiology, genetics and culture of the species, together with a bibliography of the subject, should supply *Cyclamen* admirers with all the information they are likely to require, and in a readily digestible form. Professor Blasdale does not include J. Doorenbos' "History of the 'Persian' Cyclamen" (1950) in his bibliography, which is a pity, for the two compositions are in many ways complementary. Both authors agree that *Cyclamen persicum* is not a Persian plant, and both agree that Linnaeus went sadly astray with his *Cyclamen indicum*, which is evidently little more than a misplaced monstrosity, and possibly a muddle into the bargain. Such revelations leave the taxonomist little voice for criticism, but I might venture a personal opinion—that "wild" *Cyclamen persicum* Mill. var. *persicum* is still a lot more elegant and refined than the Giant, Crested, Curled, Rococo, Papilio and Double strains so favoured by horticulturists.

R. D. MEIKLE.

* Dr. G. Erdtman (*in litt.*) remarks "This ought to be important. Could not the grain come from an *Ephedra*?" Dr. Erdtman also questions Chiguryayeva's statement that "it is almost impossible" to make a mistake in the identification of *Welwitschia* microspores, and points out that more or less ephedroid pollen is to be found also in the *Araceae* (*Spathiphyllum*).

† Dr. Erdtman remarks, in regard to the *Euphorbiaceae*, *Polygonaceae*, *Santalaceae* and *Leguminosae*, that these families include plants with several different pollen types and poses the very pertinent question as to which types were found among the fossils.

‡ *Cyclamen persicum*, its Natural and Cultivated Forms, by Walter C. Blasdale, pp. 49, tt. VII + 7, Stanford University Press, Stanford, California (London: Geoffrey Cumberlege, Oxford University Press). Price 12/- net.

Flora of West Virginia.*—The second part of this excellent regional flora includes the families of *Diospyraceae* from *Saururaceae* to *Leguminosae* in, approximately, the Engler and Prantl arrangement. With few exceptions, the nomenclature and sequence followed is that used by M. L. Fernald in the 8th edition of Gray's Manual (1950). Amongst the larger genera dealt with are *Quercus*, *Polygonum*, *Silene*, *Ranunculus*, *Onosmodium*, *Rubus*, *Prunus*, *Typhlocyba*, *Desmodium*, and *Legedera*.

Attention may be called particularly to the treatments of *Onosmodium* (with 25 tentatively accepted and named "species") and *Rubus* (with 80 "species"). In both these genera it is highly probable that a limited number of diploid species extended their ranges following vegetational changes brought about by man, met. and hybridized, giving rise to variants more or less intermediate in morphological characters, triploid or otherwise aberrant in chromosome constitution, and often apomictic. How such groups can best be dealt with taxonomically remains an unsolved and debatable problem.

As in Part I, the keys and descriptions are concise and generally commendable for a flora of this kind. The family descriptions might often have been fuller with advantage. The black and white illustrations are by several artists and must serve greatly in determination of specimens, especially in the field.

W. B. TURRILL.

Baileya.†—The work done for scientific horticulture at the Bailey Hortorium, Cornell University, Ithaca, New York, is well known to horticulturists and to botanists. A new quarterly journal "devoted to the botany of cultivated plants and especially to their identification, nomenclature, classification, and history in cultivation" is appropriately named after Liberty Hyde Bailey who has done so much to link botany and horticulture. The publication of the first issue coincided with Dr. Bailey's 95th birthday (15 March). Presumably Dr. G. H. M. Lawrence is editor.

There is no doubt that such a publication can serve a very useful function in making gardeners more botanically minded and in making botanists realize the scientific value of cultivating and studying living plants. There is much to be gained by horticulturists and botanists learning of one another's problems and jointly aiding in solving them.

In the first two numbers there are articles on various groups of flowering plants: Mexican Amaryllids, *Gynophylla*, *Phoenix*, *Iris*, *Aspidodendrum*, *Equisetum*, etc. by various authors, especially G. H. M. Lawrence and H. E. Moore Jr. In addition, there are useful notes on nomenclature and terminology.

We wish the venture every success.

W. B. TURRILL.

* P. D. Strausbaugh and E. L. Core. Flora of West Virginia. Part II., West Virginia University Bulletin, Series 53, No. 12-1 (June 1953).

† Baileya, A Quarterly Journal of Horticultural Taxonomy, vol. 1, Nos. 1 and 2, New York, March and June 1953, \$2 per year (of 4 numbers).

SOME NEW SPECIES OF PAVETTA L. FROM TROPICAL AND SOUTH AFRICA : II*

C. E. B. BREMEKAMP.

Unless otherwise indicated, cited specimens are in the Kew Herbarium.

1a. ***Pavetta yalaënsis* Brem., sp. nov.** : subgeneris *Eucosmum*, series *Eucosmum*. Folia petiolatis forma lanceolatis siccate non omnino nigrescentibus, inflorescentia pubescente, a speciebus aliis ad sentem hanc pertinentibus distinguenda.

Flores 1.5–4.5 m. altas, ramis foliisque glabris. *Rami* siccate nigrescentes. *Folia* petiolata : petiolus 0.5–1 cm. longus ; lamina lanceolata, 7.5–15 cm. longa et 1.5–4 cm. lata, subaruminata, basi acuta, coriacea, siccate supra saturate, subtus dilute olivacea, costa subtus prominente albida, in axillis nervorum demarctis parvis instructa, nervis utroque latere costae 6–8 subtus prominentibus. *Stipulae* in aristam vaginæ subaequilongam productae, extra glabrae, intra axillam pubescentes. *Inflorescentia* pubescens : ramuli inferiores foliis redactis suffulti. *Lobus* lobis ovatis, 2–5 mm. longi et 1–5 mm. lati, flore aperte non imbricati. *Corollae* tubus 4–5.5 mm. longus, lobis 6 mm. longis. *Stylus* 2–3 mm. longus.

KENYA. Nandi District. Kaimosi, N. of Yala River, evergreen forest undergrowth. 31 May 1943. C. Gilbert Rogers 741 (holotype) : 1.5–4.5 m. high : flowers white ; petals turn black when open.

268. ***Pavetta cataractarum* S. Moore var. *hirtiflora* Brem., var. nov.** : ramis novellis sparse strigosis, foliis supra sparsissime et brevissime pilosis, siccate brunnescentibus, ramulis inflorescentiae pedicellisque hirtellis, corolla extra etiam hirtella a typo recedens.

SOUTHERN RHODESIA. Chirinda, on the bank of the Zambesi. 17 Dec. 1947. W. J. H. 332 S.R.G.H. 78473 :—shrub ; flowers white.

The leaves of the var. *anacardium* in the herbarium are on both sides grey : those of the var. *hirtiflora* on the upper side slightly glossy and brown, on the lower side grey-brown. In the var. *anacardium* the inflorescence is covered with a grey tomentum, in the var. *hirtiflora* it is hirtellous and grey-brown, and the corolla-tube is in the var. *anacardium* on the outside glabrous, and in the var. *hirtiflora* hirtellous.

273a. ***Pavetta gersneri* Brem., sp. nov.** : sectionis *Crinitae*, series *Longipetalarum*, foliis oblanceolatis ad *P. mucronellam* Chiov. accedens, foliis distincte petiolatis et subcoriaceis, calvulis lobis longioribus ab ea distinguenda.

Arbor. *Rami* novelli pubescenti, mox vertice griseo opaco vestiti. *Flores* in petiolum puberulo-pubescentem circiter 1 cm. longum contracta : lamina oblanceolata, 3–5 cm. longa et 0.4–1.6 cm. lata, apice subacuta, basi sensim in petiolum contracta, margine revoluta, subcoriacea, novella siccate fuscescentia, vetustiora vix conspicue discolorata, utrimque glabra.

* Continued from Kew Bull. 1948, 367, 1949.

† The numbers are those used in my "Monograph of the genus Pavetta" for the species in whose vicinity the new ones will have to find a place.

nervis utroque latere costae plerumque 4 vix conspicuis, domatiis nullis, nodulis plurimis ad costam adjicientibus. *Stipulae* late triangulares, in aristam 2 mm. longam exeuntes, extra pubescentes, intus in axilla sericeae. *Rami floriferi* 3–4 cm. longi, omnino cortice cinereo obtecti, graciles, plerumque ex internodio uno longo constantes, apice plerumque jugis duobus foliorum magnitudine paulo redactorum coronati. *Inflorescentia* ex floribus circiter 50 composita; ramuli primarii 1.5–3 mm. longi, densius hirtello-pubescentes, siccitate nigrescentes; ramuli alii subnulli; pedicelli 3–4 mm. longi, breviter hirtelli, siccitate nigrescentes. *Ovarium* subglabrum. *Calycis* tubus 0.4 mm. altus, lobis linearibus 2 mm. longis et 0.7 mm. latis margine ciliolatis. *Corolla* extra glabra, tubo 10 mm. longo intus sparse piloso, lobis 4.5 mm. longis. *Antherae* 3.5 mm. longae. *Stylus* 22 mm. longus. *Drupa* nondum visa.

NATAL. Zululand. Native Reserve 1, at chief uMavabela Mhlul's kraal, 30 Oct. 1944, *Gerstner* 4992 (mixed with *Tarenna* cf. *pavettoides* Sim) (holotypus) :—beautiful tree with snow-white flowers.

274a. ***Pavetta lanceisepala*** Brem., sp. nov.; subgeneris *Pavettae* ("Eu-pavettae"), sectionis *Crinitae*, series *Latisepalarum*, maxime ut *P. sphaerobotrys* K. Sch. sed foliis angustioribus, calycis lobis longioribus, corollae tubo brevioris, lobis longioribus ab ea recedens.

Arbor glabra. *Folia* petiolata; petiolus 1–1.5 cm. longus; lamina oblanceolata, 7–12 cm. longa et 3–4 cm. lata, acuminata, basi sensim in petiolum contracta, subcoriacea, siccitate griseo-olivacea, costa subtus prominula, nervis utroque latere costae 7–8. *Stipulae* elongatae, cuspidatae. *Rami floriferi* ex internodiis pluribus formati, apice jugis duobus foliorum coronati. *Inflorescentia* contracta, ramulis pedicellisque tamen distinctis, floribus ultra 50. *Calycis* lobi lanceolato-oblongi, 6 mm. longi et 1.8 mm. lati, acuti, 3-nervi. *Corollae* tubus 7 mm. longus, lobis 6 mm. longis. *Stylus* 15 mm. longus.

TANGANYIKA. Tanga District. Amboni, River Mkulumuzi, in river-bank forest, 3 July 1932, *Geilinger* 605 (holotypus) :—flowers white.

274b. ***Pavetta manamoca*** Brem., sp. nov.; sectionis *Crinitae*, series *Latisepalarum*, maxime ut *P. sphaerobotrys* K. Sch., sed stipulis intus glabris, calycis lobis brevioribus, corollae lobis paulo longioribus, stylo longiore ab ea recedens.

Arbor parva, ramis glabris opacis vetustioribus cortice griseo opaco vestitis. *Folia* in petiolum glabrum 1–2 cm. longum contracta; lamina oblonga obovata vel oblanceolata, 4.5–8 cm. longa et 1.5–5 cm. lata, acuta vel acuminata et mucronata, basi contracta, siccitate fusciscentia, utrimque glabra, costa supra canaliculata subtus prominente, nervis utroque latere costae 5–7, domatiis nullis. *Stipulae* ovatae, hyalino-marginatae, in aristam quam vagina brevioris vel subaequilongam exeuntes, extra intusque glabrae. *Ramuli floriferi* internodiis 2 vel 3 longitudine decrescentibus formati, interdum ramulo florifero axillari muniti, apice duobus jugis foliorum coronati. *Inflorescentia* e floribus circiter 45 composita, omnino glabra; ramuli 1–2 mm. longi; pedicelli 5–7 mm. longi. *Ovarium* glabrum. *Calycis* tubus urceolaris, vix 0.5 mm. longus, lobis oblongis 2 mm. longis et 1.3 mm. latis subacutis omnino

glabris. *Corolla* extra glabra, tubo 8–9 mm. longo et 0.6–0.7 mm. diametro intus subglabro, lobis 5 mm. longis et 2 mm. latis acutis. *Stylus* 2–2.5 cm. longus.

KENYA. Tana River District. Garissa, 10 Jan. 1947, Mrs. Adamson 357 in Bally 5851 (holotypus):—bushy tree: vernacular name (Boni) “manamoka”.

P. manamoka is doubtless a near ally of *P. sphaerobotrys* K. Sch., from which it differs in the absence of hairs in the axils of the stipules, a less strongly contracted inflorescence, a shorter calyx, longer corolla-lobes and a longer style.

277a. ***Pavetta inyangensis* Brem.**, sp. nov.; sectionis *Crinitae*, series *Transvaalensium* foliis majoribus longius acuminatis et numero majore nervorum instructis a speciebus aliis recedens.

Frutex. *Rami* vestustiores cortice cinereo vestiti. *Folia* in petiolum sparse pubescentem vel subglabrum 2–6 mm. longum contracta; lamina elliptico-lanceolata vel oblanceolata, 5.5–11.5 cm. longa et 2.3–4.0 cm. lata, apice longius acuminata, basi contracta, tenuis, siccitate olivacea, opaca, utrinque pilis satis longis sparse pubescens, nervis utroque latere costae 6–9 tenuioribus. *Stipulae* ovato-oblongae, extra sparse pubescentes, intra axillam sericeae, apiculatae. *Rami floriferi* 4.5–8 cm. longi, ex internodio singulo longo constantes, apice uno vel duobus jugis foliorum magnitudine paulo redactorum coronati. *Inflorescentia* e floribus circiter 25 composita; ramuli ultimi pedicellis subaequilongi et ut hi hirtelli. *Pedicelli* 4–5 mm. longi. *Ovarium* sparse hirtellum. *Calycis lobi* 6–7 mm. longi, margine et costa sparse ciliati. *Corolla* extra glabra, tubo 14 mm. longo, intus dense piloso, lobis 6 mm. longis et 2 mm. latis. *Stylus* 3.5 cm. longus.

SOUTHERN RHODESIA. Inyanga District. Pungwe Gorge, 1800 m., 16 Jan. 1951, Chase 3657 (S.R.G.H. 33823) K, typus, SAL, U, isotypi.

This species shows a rather striking resemblance to *P. stenosepala* K. Schum., but the much smaller size of the bracts at the base of the inflorescence and the greater length of the branchlets of the latter assign it a place in the series *Transvaalenses*. It differs from the other species of this series by the larger rather long-acuminate leaves with their greater number of nerves.

280a. ***Pavetta divaricata* Brem.**, sp. nov.; sectionis *Crinitae*, series *Transvaalensium*, maxime ut *P. gracilifolia* Brem. et *P. zoutpansbergensis* Brem., sed ab ambabus internodio secundo rami floriferi ab internodio primo longitudine haud multum diverso distinguenda, a *P. gracilifolia* insuper foliis majoribus, a *P. zoutpansbergensi* inflorescentia glabra recedens.

Frutex, ramis gracilioribus divaricatis instructus. *Rami* novelli toti glabri vel ad nodos sparse pubescentes, vetustiores cortice cinereo vestiti. *Folia* breviter petiolata; petiolus 1–3 mm. longus, supra breviter sed dense pubescens, subtus glaber; lamina subcoriacea, ovato-lanceolata vel oblonga, 2–4 cm. longa et 1–2 cm. lata, utrinque glabra vel subtus in axillis nervorum interdum fasciculis pilorum instructa, siccitate nigrescens, nervis utroque latere costae 3–4 vix conspicuis, domatiis nullis, nodulis paucis et difficiliter distinguendis. *Stipulae* extra pubescentes,

dimidio superiore scariosae, arista vagina paullo longiore coronatae. *Rami floriferi* ex internodiis 2 vel 3 compositi, basin versus cortice cinereo vestiti, internodio secundo primo paullo brevior, tertio brevissimo, foliis minime usque ad anthesin persistentibus. *Inflorescentia* glabra, e floribus circiter 15 composita; ramuli primarii pedicellis dimidio breviores; pedicelli 2–3 mm. longi. *Ovarium* glabrum. *Calycis* tubus campanulatus, vix 1 mm. altus, lobis anguste triangularibus 5–5.5 mm. longis margine sparse et vix conspicue ciliolatis. *Corolla* extra glabra, tubo 12 mm. longo intus sparse piloso, lobis 5.5 mm. longis. *Stylus* 26 mm. longus.

PORTUGUESE EAST AFRICA. Lourenço Marques District. Maputo, in thicket bordering riverine fringing forest, 30 Jan. 1947, *Hornby* 2576 (K, holotypus, NHP, isotypus):—lax-stemmed slender shrub with white flowers.

282a. ***Pavetta lindina* Brem.**, sp. nov.; sectionis *Crinitae*, series *Transvaalensium*, maxime ut *P. trichardensis* Brem. et *P. woodii* Brem., sed indumento densiore, foliis distinctius petiolatis basi obtusis vel subacutis, calycis lobis longioribus, stylo paulo brevior ab eis recedens.

Fruticulus subscandens, ramis gracilibus, novellis albo-tomentellis, vetustioribus cortice primo griseo-brunneo deinde griseo obtectis. *Folia* petiolo tomentello 3–10 mm. longo instructa; lamina membranacea, obovata vel oblonga, 2.0–5.5 cm. longa et 1.0–2.7 cm. lata, apice acuta et mucronata, basi obtusa vel subacuta, siccitate supra olivacea, supra primo dense deinde sparse villosa, subtus in costa nervisque prominulis albido-tomentosa, inter nervos griseo-tomentella, nervis utroque latere costae 4–6. *Stipulae* ovato-triangulares, aristatae, extra tomentellae, intus in axilla pilis sericeis longis instructae, ceterum glabrae. *Rami floriferi* ex internodio 3–6 cm. longo et internodio brevissimo constantes, foliis internodii longi sub anthesin plerumque deciduis, eis internodii brevis persistentibus. *Inflorescentia* e floribus plerumque 9 composita, ramulis pedicellisque griseo-tomentellis; ramuli 3–5 mm., pedicelli 1–3 mm. longi. *Ovarium* albo-tomentosum. *Calyx* fere ad basin partitus, lobis subulatis 6.5 mm. longis et basi 0.9 mm. latis griseo-pubescentibus. *Corolla* alba, tubo extra pubescente 15 mm. longo et 0.9 mm. diametro intus sparse piloso, lobis 5 mm. longis et 1.8 latis extra intusque glabris siccitate nigro-apiculatis. *Stylus* 2.6 cm. longus.

TANGANYIKA TERRITORY. Southern Province, Lindi District. Rondo Plateau, scarp face below Mchinjiri, in closed forest, Feb. 1951, *Eggeling* 6038 (EA, holotypus):—scrambling undershrub.

303a. ***Pavetta stephanantha* Brem.**, sp. nov.; sectionis *Brachypodis*, series *Verticilliflorarum*, maxime ut *P. decumbens* K. Sch. et K. Krause, sed ab ea foliis majoribus et latioribus nervis paucioribus instructis, floribus minoribus distincta.

Suffrutex sub solo ramificatus, ramis supra solum emergentibus erectis 15–25 cm. altis. *Ramorum* pars annotina tomentosa. *Folia* petiolata; petiolus circiter 4 mm. longus, dense pubescens; lamina lanceolato-elliptica vel elliptica, 4–5.5 cm. longa et 1.5–2.8 cm. lata, utrinque tomentella et insuper subtus in nervis tomentosa, discolor, siccitate supra

olivaceo-nigra, subtus grisea, nervis utroque latere costae circiter 8. *Stipulae* extra tomentosae, intus griseo-sericeae, in aristam pilosam 4-5 mm. longam productae. *Rami floriferi* semper brevissimi, nunquam 3 mm. excedentes. *Inflorescentiae* e floribus circiter 27 compositae, griseo-tomentosae, ramulis vix conspicuis, pedicellis 2 mm. longis. *Ovarium* tomentosum. *Calyx* tomentosus, tubo brevi, lobis late triangularibus 0.7 mm. longis. *Stylus* 17 mm. longus.

PORTUGUESE EAST AFRICA. Quelimane District. Muobede road, 15 Nov. 1948, *Mrs. Faulkner* 346 (K, holotypus):—small woody plants; flowers pure white, attractive.

324a. ***Pavetta capillipes*** Brem., sp. nov.; sectionis *Brachypodis*, stipulis intus glabris ad species serierum *Scandentium* et *Glabristipularum* accedens, foliis utrinque laevibus a *Scandentibus*, inflorescentiis e floribus paucioribus compositis a *Glabristipulis* distinguenda.

Habitus ignotus sed probabiliter subscandens, ramis novellis glabris mox cortice griseo opaco vestitis. *Folia* sensim in petiolum subglabrum 1-1.5 cm. longum contracta; lamina elliptica vel oblonga, 5.5-10.5 cm. longa et 2-4.7 cm. lata, apicem et basin versus contracta, apice ipsa obtusa et mucronulata, membranacea, siccitate supra saturate subtus dilute olivacea, utrinque glabra, costa subtus prominula, nervis utroque latere costae 6-7. *Stipulae* in vaginam cylindricam connatae, basin versus puberulae, apice in aristam patentem 2 mm. longam productae, intus subglabrae. *Rami floriferi* usque ad 1 cm. longi, plerumque tamen multo breviores. *Inflorescentia* glabra, siccitate nigrescens, ramis pedicellisque gracillimis, e floribus 9-15 composita; pedunculus circiter 5 mm., ramuli 3 mm., pedicelli 8-12 mm. longi. *Ovarium* subglabrum. *Calycis* tubus urceolatus, 0.5 mm. altus, lobis triangularibus 1.2 mm. longis sparse ciliolatis. *Corolla* extra glabra, tubo 11 mm. longo et 0.6 mm. diametro, intus subglabro, lobis 7 mm. longis et 1.5 mm. latis. *Stylus* 2.5 cm. longus.

KENYA. Kitui District. Ikutha, alt. 650 m., 22 Jan. 1942, *Bally* 1605 (holotypus).

In the shape and size of its leaves and of its flowers this species reminds one of the widespread *P. assimilis* Sond., but the shoots are monopodial, and the absence of the silky pubescence in the axils of the stipules seems to exclude a closer affinity. Stipules glabrous or subglabrous inside are found in the series *Scandentes* and *Glabristipulae*, which are doubtless nearly related to each other. The species belonging to these groups differ mainly in habit. The long internodes of the main branches and the very short axillary brachyblasts of the new species suggest a subscandent mode of growth, which would bring it in the series *Scandentes*. In the small number of flowers per inflorescence it agrees with *P. sepium* K. Sch., one of the species of this group. It differs from that species in the much larger, entirely smooth leaves, and in the somewhat larger size of the flowers. The species of the series *Glabristipulae* have a larger number of flowers in their inflorescences.

Wild Flowers of the Ceylon Hills.*—This work describes 120 of the commonest species of flowering plants to be found in the hills of Ceylon above the 300-foot contour line. It is primarily intended as an aid to determination. The descriptions appear to have been prepared carefully and are based on studies of the living plants. There are also black and white illustrations and a frontispiece showing eight species in colour. The black and white text figures are of varying merit. That of the naturalized *Verbascum thapsus*, p. 147, makes one doubt if the species has been correctly determined. There are no keys apart from the incomplete ones of the "guide to the identification of the species" near the beginning of the book.

A high proportion of the species described and figured are different from those found on the mountains and hills in Europe. All but some half-a-dozen of the families and forty per cent of the genera are, however, represented in the flora of Europe. It is interesting to note that some aliens, such as species of *Oxalis* spreading mainly by bulbils, have become widely established.

While this book will no doubt be of considerable value to students visiting the Ceylon Hills and also makes interesting reading for the non-specialist, one suspects it has the irritating defects of incomplete floras. It deals with "the most common species" of the area. How many less common species there are is not stated but a student finding one may waste much time trying to determine it from this book. Further, if there be rarer species closely allied to a commoner one that is alone figured and described the unwary beginner may be led to make a wrong determination

W. B. TURRILL.

Horticultural Handbooks.†—Gardeners are nowadays well served with a great variety of books and periodicals. These range from the tomes of the R.H.S. Dictionary of Gardening to weekly publications of a few pages. Contents vary as much as price and format. There are books for beginners and books for specialists; books attempting to summarize all horticulture and books devoted to one genus; books for the practical gardener and books for the arm-chair dilettante.

The booklets* here noticed are for the amateur in the sense of beginner, though written by specialists with personal experience of their subject. They are attractively produced at what must, in these times, be considered a fairly reasonable price. Essentially the booklets are practical guides to horticulture or to some special branch of it. The text naturally varies in literary value with the author and the subject treated but it is mostly clear, concise, and "readable".

W. B. TURRILL.

* T. E. T. Bond, *Wild Flowers of the Ceylon Hills*, Oxford University Press, 1953, pp. 240 + XVIII. Price Rs 10.

† *Amateur Gardening Handbooks*: No. 5, *Greenhouse Flowers* by J. S. Dakers; No. 6, *Roses* by H. Edland; No. 7, *Greenhouse Chrysanthemums* by E. Morley Jones; No. 8, *The Beginner's Garden* by P. R. S. Hunt. W. H. and L. Collingridge Ltd., London, 1953, 3/6d. each.

SOYAUXIA, A SECOND GENUS OF MEDUSANDRACEAE.

J. P. M. BRENNAN

One of the most unusual morphological features of the family *Medusandraceae*, described in Kew Bull. **1952** : 227-236 (1952), is the structure of its ovary : unilocular, with 6-8 apical ovules, and with a slender central column passing through the ovary cavity and attached at base and apex. The family was then monotypic, with a single species from the British Cameroons.

One day, during the sorting of some W. African specimens, some fruits showing the same central column free except at base and apex attracted attention ; these proved to belong to the genus *Soyauxia* Oliv., placed in *Passifloraceae*. Clearly, further research was indicated. The result of this has been to suggest that *Soyauxia* has been wrongly placed systematically, and that it should be transferred to *Medusandraceae*. Let us now examine the evidence for this assertion.

Oliver placed *Soyauxia* in *Passifloraceae*, remarking (Hook. Ic. Pl. t. 1393 : 1882) that it " I suppose may be regarded as connecting these with *Samydaceae* through *Dissomeria* ". This was followed by Hutchinson & Dalziel, Fl. W. Trop. Afr. **1** (1927).

Warburg, in Engler & Prantl, Nat. Pflanzenf. ed. I, **3** (6A) (1894), transferred it, together with the group *Paropsieae* from *Passifloraceae* to *Flacourtiaceae*. This view has been followed by Engler, Pflanzenwelt Afr. (Veg. Erde 9) **3** (2) (1921) ; Gilg in Engler & Prantl, Nat. Pflanzenf., ed. 2, **21** (1925) and by Lemeé, Dict. Genres Pl. Phan. **6** (1935).

Metcalf & Chalk (Anatomy of the Dicotyledons **I** : 679 : 1950), who kept *Soyauxia* in *Passifloraceae*, wrote : " *Soyauxia* has been included here, following Hutchinson. In some respects it appears to have more in common with the *Flacourtiaceae*, cf. *Idesia* ; on the other hand, it might be fitted into *Passifloraceae* on the assumption that it is a primitive type, of which there is ample evidence in the wood structure."

At this stage the question naturally arises of why *Soyauxia* was ever placed in *Passifloraceae* or *Flacourtiaceae*. The answer is perhaps given by the fact that although Oliver correctly described the apical ovules and the unilocular ovary, he completely missed the presence of the central column. This omission is understandable, in view of the minuteness of the ovary, the fragility of the central column, and the standard of optical equipment seventy years ago. Likewise none of the later botanists who have worked on *Soyauxia* have noticed it, and their illustrations omit it. I have observed this column in the following species : *Soyauxia floribunda* Hutch., *S. gabonensis* Oliv., the type of the genus (including *S. bipindensis* Gilg ex Hutch. et Dalz.), *S. glabrescens* Engl., *S. grandifolia* Gilg et Stapf and *S. velutina* Hutch. et Dalz. I have not examined *S. talbotii* Bak. f. or *S. ledermannii* Sleum. There is thus evidence that the presence of the column is a normal and constant feature of the genus. However this ovary-structure evolved, it seems clear that it cannot be directly derived from an ovary with parietal placentation, and that *Soyauxia* is out of place in *Passifloraceae* or *Flacourtiaceae*, where parietal placentation is the rule.

The evidence for and against its inclusion in *Medusandraceae* must now be looked at. Among gross morphological characters that are common both to *Soyauxia* and *Medusandraceae* are the following :—

1. Woody habit.
2. Leaves alternate, simple.
3. Stipules present.
4. Inflorescences axillary, often racemose.
5. Flowers hermaphrodite, actinomorphic.
6. Sepals and petals 5, latter free, imbricate in bud.
7. Anthers quadrilocular, with characteristic lateral dehiscence by flaps.
8. Ovary superior, syncarpous, unilocular, with a central column attached at base and apex, otherwise free.
9. Ovules 6, pendulous, apical, with a superior micropyle pointing outwards.
10. Styles 3, free, with minute stigmas.
11. Calyx persistent in fruit and more or less accrescent.
12. Fruit capsular, splitting into 3 (–4) valves ; central column persistent.
13. Seed single, large, with copious endosperm and small embryo.

In addition to all this there is a similarity in facies.

Soyauxia differs from *Medusandra* in the following ways :—

1. Leaves entire, not crenate or crenate-serrate.
2. Sepals in bud imbricate, not open.
3. Fertile stamens numerous, not 5 ; filaments long, not short.
4. No staminodes.
5. Styles elongate, not short.
6. A collar-like disc round the ovary.

It will, I think, be agreed that the characters in common are not only more numerous, but of greater taxonomic significance than those that are not. The differences in the androecium and the disc are admittedly important but not necessarily inconsistent with membership of the same family. Differences of the same order are to be met within such families as *Passifloraceae* and *Flacourtiaceae*.

Material of *Soyauxia* was submitted to Dr. C. R. Metcalfe, Keeper of the Jodrell Laboratory, Royal Botanic Gardens, Kew, for anatomical investigation. He kindly wrote the following report :—

“All of the species of *Soyauxia* you submitted have now been examined, and they *all* resemble *Medusandra* in most of the important diagnostic characters which they exhibit. There is, however, still the difficulty that a well developed system of secretory canals occurs in the pith of *Medusandra* whereas no such canals have been seen in any of the species of *Soyauxia*. The presence of secretory canals is a somewhat fundamental character, to which the systematic anatomist attaches considerable taxonomic importance. If, therefore, *Medusandra* and *Soyauxia* are sufficiently alike to be placed in the same family, it is rather surprising to find that secretory canals are present in the one genus and not in the other. In this connection you may remember how I mentioned that the protoxylem of *Soyauxia* tends to break down in the stem to produce intercellular cavities.

This was particularly noticeable in *Soyauxia velutina*. As the canal system in *Medusandra* appears to be closely associated with the protoxylem, at least in some places, it may be that the cavities in *S. velutina* may represent incipient canals. On the other hand they may be artefacts caused by contraction in drying. In spite of the lack of canals, *Soyauxia* resembles *Medusandra* so closely in other characters that I suspect that you may well be right in believing there to be a taxonomic affinity between the two genera. I don't think much more can be done, however, without carefully fixed material of very young stems of both genera."



FIG. 1. *Soyauxia floribunda* Hutch. a: ovary, l.s., $\times 30$; b: ovary, t.s., $\times 30$ (central column and ovules white); c: two fruits attached, $\times 1\frac{1}{2}$; d: dehiscent fruit, $\times 3$, showing persistent central column attached at base of ovary and at apex of left-hand valve.

I wrote to Professor G. Erdtman, Director of the Palynological Laboratory at Bromma in Sweden, sending him polliniferous material of *Soyauxia* and asking him if the pollens of *Soyauxia* and *Medusandra* were similar. He kindly replied:—"In my pollen book [Pollen Morphology and Plant Taxonomy: Angiosperms, 179: 1952] . . . I have described the pollen grains of *Soyauxia bipindensis* Gilg under *Flacourtiaceae* (among genera of more or less uncertain position). The grains are small (about $15.5 \times 16.5\mu$) and provided with three furrows (colpi), just as the grains in *Medusandra*. The grains in the *Passifloraceae* are different.

Soyauxia is referred by Gilg to *Flacourtiaceae*, tribe *Paropsieae*. This tribe is heterogeneous, since it seems impossible to me to refer e.g. *Soyauxia* to the same tribe as *Barteria* . . . *Flacourtiaceae* sensu Gilg is in need of revision. Some genera should be referred to the *Passifloraceae*, others—and among these evidently *Soyauxia*—should be referred to other units."

More detailed study by Prof. Erdtman of the pollen of *Soyauxia* resulted in a further reply:—

"The result of the study of *Soyauxia* is as follows:

Pollen grains usually 3-colporate—3-colporoidate, oblate-spheroidal—suboblate (equatorial diameter $15.5\text{--}18\mu$). Sexine as thick as nexine (or

a little thinner or thicker), reticulate (OL-pattern ; size of brochi decreases towards colpi ; muri not particularly narrow). Colpi margins incrassate except at ora (oroids).

Species investigated :

S. bipindensis Gilg (Cameroon, Zenker 2390) : 3-colporate, $15.5 \times 16.5\mu$. Ora lalongate.

S. floribunda Hutch. (Liberia, Baldwin 6915) : 3-colporoidate (-colporate), about $14 \times 16.5\mu$.

S. gabonensis Oliv. (Nigeria, Jones 6487) : 3-colporate, $13.5 \times 15.5\mu$. Sexine as thick as nexine or slightly thicker, its surface not quite smooth. Ora lalongate. Some grains \pm bilateral, provided with two apertures only.

S. grandiflora Gilg & Stapf (Liberia, Baldwin 11189) : 3-colpor(oid)ate, $13 \times 18\mu$. Sexine usually as thick as nexine, its surface not quite smooth.

You may of course use these short descriptions as you like. I cannot suggest, on the basis of pollen morphology alone, that *Soyauxia* is related to *Medusandra*. Undoubtedly there are certain similarities, however (the small size, the shape, and the stray occurrence of 2-aperturate grains in *Medusandra* as well as in *Soyauxia gabonensis*). Unfortunately, the small size of the grains in *Medusandra* makes it impossible to state if there are further similarities in the way of sexine pattern and other details."

He further adds :—

" Pollen grains \pm similar to those in *Soyauxia* are often met with (e.g. in *Curtisia* (Cornaceae), S. Africa). The nyssaceous pollen grains are fairly similar to those in *Soyauxia* although considerably larger."

Soyauxia resembles *Medusandra* in many significant points both of gross morphology and of anatomy, sufficiently so, I consider, to justify postulating taxonomic relationship. The evidence of the pollen points to the fact that *Soyauxia* is misplaced both in *Passifloraceae* and *Flacourtiaceae*, and while alone it does not go far enough to suggest relationship with *Medusandra*, it is not against it. There are also, indeed, important discrepancies, both morphological and anatomical, between *Soyauxia* and *Medusandra* ; the relationship, although in my opinion clear, is thus not close. I propose that *Soyauxia* should be transferred from *Passifloraceae* or *Flacourtiaceae* to *Medusandraceae*, where it will be the second genus of the family and order whose description must be consequently modified.

Medusandrales Brenan, descr. hic emend.

Arbores mediocres vel frutices, in *Medusandra* canalibus secretoriis percursora. *Folia* alterna, simplicia, integra vel obscure crenata vel crenato-serrulata ; stipulae mox caducae, parvae. *Flores* ♂, racemosi vel spicati, actinomorphi, hypogyni vel perigyni. *Sepala* 5, alabastro aperta vel imbricata, libera vel imo basi tantum connata. *Petala* 5, libera, alabastro imbricata. *Stamina* fertilia 5, petalis opposita, vel numerosa, inter se libera, petali imo basi plus minusve conjuncta vel saepius libera ; staminodia 5 vel nulla ; antherae quadriloculares, lateraliter ceu foribus dehiscentes. *Ovarium* superius, syncarpum, uniloculare, columna centrali tenui basi apiceque apta, basi ovarii in *Soyauxia* disco circumcincta ; ovula apice ovarii circum apicem columnae affixa, 6-8, pendula, ana-

tropa, micropyllo superiori. *Styli* 3 (-4), liberi. *Fructus* calyce persistenti plus minusve accrescenti suffultus, demum capsularis et in valvas 3 (-4) fissas, nonnunquam cohesione valvarum duarum spurie bivalvis. *Semina* pendula, in utroque fructu unica, magna, plus minusve rugosa vel angulata; endospermium copiosum, pallidum, paulum ruminatum; embryo parvus, rectus.

Medusandraceae *Brenan*.

Characteres ut supra, sub ordine.

1. **Soyauxia** *Oliv.* in Hook, Ic. Pl. t. 1393 (1882).

Arbores mediocres vel frutices, canalibus secretoriis ut videtur absentibus. *Folia* integra. *Flores* racemosi vel spicati. *Sepala* alabastro imbricata. *Stamina* fertilia numerosa, filamentis longis. *Staminodia* nulla. *Styli* elongati. *Ovarium* basi disco circumcinctum. Species 7. Gambia, Sierra Leone, Liberia, Ivory Coast, Gold Coast, Nigeria, the French Cameroons and Gaboon.

2. **Medusandra** *Brenan* in Kew Bull. 1952 : 228 (1952).

Arbor mediocris, ubique canalibus secretoriis materias citrinas capientibus percursa. *Folia* obscure crenata vel crenato-serrulata. *Flores* racemosi. *Sepala* alabastro aperta. *Stamina* fertilia 5, petalis opposita, filamentis brevibus. *Staminodia* 5, elongata, staminibus alternantia. *Styli* breves. *Discus* basi ovarii nullus. Species 1. British Cameroons.

Microscopical Structure of the Higher Plants.*—A botanist visiting the Jodrell Laboratory some 15 years ago expressed the view that there was no need for further research into the anatomy of plants because the subject was already so well known. This point of view, which is still alive in some quarters today, seemed at the time somewhat startling to the reviewer who was only too well aware, through his studies in systematic anatomy, and from experiencing the difficulties that arise in the daily routine of identifying miscellaneous botanical material by its micro-morphological characters, of the vast number of plants, especially from undeveloped countries, concerning the structure of which but little is known. Although considerable progress in comparative anatomy has been made in recent years, there is still much that remains to be done in the way of comparative studies alone. Recent investigations into the developmental anatomy of plants have also made us more familiar with the dynamics of plant structure, thus helping to unify botanical science by showing that the student of physiology cannot progress to the best advantage without the helping hand of his anatomical colleague. In spite of this, the study of plant anatomy generally occupies but a small fraction of the time of the average, hard pressed, botany student in Great Britain. There is a real danger that, unless the study of plant anatomy

* Plant Anatomy, by Katherine Esau. pp. vii + 735; 85 pls.; numerous line drawings; John Wiley and Son Inc. New York; Chapman and Hall Ltd. London. Price 72/- net.

receives more serious attention in British Universities, we shall find ourselves, in this branch of botany, falling still further behind our colleagues on the European and North American continents.

With this background in mind, the appearance of Professor Katherine Esau's textbook is a timely event, and one that has been eagerly awaited by those who knew she was writing it. Professor Esau, of the University of California, is already well known to a wide circle of anatomists through her painstaking researches into the developmental aspects of the subject, and, as might have been expected, her book has a strongly ontogenetic background, and in this respect there is no other textbook quite like it. Despite this bias, the book can be regarded as a very useful general introduction to the structure of the seed-bearing plants. Naturally the limitations of space have made it necessary for some aspects of the subject to be severely condensed. One cannot but wish, for example, that rather more could have been included concerning the structure of plants in relation to their habitats. Then again greater attention could have been devoted to showing the value of anatomy in detecting substitutes for and adulterants of economic plant products, thereby reminding the student that the study of structure finds applications in everyday affairs. Furthermore, its service to other branches of knowledge such as palaeobotany and archaeology could have been usefully expanded. These comments are not made to decry the book, which is indeed a notable contribution to botanical literature, but rather in the hope that its usefulness may be still further increased by incorporating more information concerning these topics in future editions.

The text is divided into 20 chapters arranged in an orthodox sequence. Thus, starting with the plant body as a whole in chapter 1, we are told, in succeeding chapters, about the protoplast, the cell wall, meristems and tissue differentiation, vascular cambium, parenchyma, collenchyma, sclerenchyma, xylem, phloem and periderm. After this the anatomical organization and development of the stem, root, flower, fruit and seed are dealt with in turn. The subject matter is presented with great clarity which is reinforced by numerous excellent line drawings in the text, many of which are the author's own work, and by 85 excellent photomicrographs that are bound together at the end of the book. Some of the technical terms may not be familiar to all those who are likely to use the book, but they have been carefully chosen, and their meanings and derivations are clearly stated wherever they are first introduced in the text. At the end of each chapter there are selected bibliographies, the contents of which have been well chosen and embody important European as well as American work. It is to be hoped, however, that reference will be made to Erdtman's work on pollen in any future editions of the book that may be published. The book bears witness throughout to the unmistakable penmanship of one who has thoroughly mastered her subject, and who writes with the conviction that what she has to say is not only worth saying, but worth saying well. It is to be hoped that this forward-looking textbook will stimulate any botanists who still regard plant anatomy as a dead or stagnant subject to think again, and that it will ensure that students are kept fully aware of modern developments in the study of plant structure. Every serious student of plant anatomy should have a copy of this important book.

C. R. METCALFE.

MATERIALS FOR A REVISION OF MALAYAN DURIO WITH NOTES ON BORNEAN SPECIES.

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The present paper is a result of the researches I have made in view of the difficulty I have continually had in trying to name the wild durians of the Malay Peninsula.

The earliest Malayan species of *Durio* described were *D. zibethinus* Murr. [Syst. Nat. Vég., ed. 13, 581 (1774)], a commonly cultivated species in the tropical Far East, and *D. oxleyanus* Griff. [Calc. Journ. Nat. Hist., **5**, 115 (1845)], both of which are still accepted as distinct species. Korthals [Verh. Nat. Gesch. Bot., 257 (1844), t. 69] proposed a new genus *Boschia* and described the Bornean species *B. excelsa* Korth.; this genus has subsequently been reduced by Bakhuizen van den Brink [Bull. Jard. Bot. Buit., Ser. 3, **6**, 162, 224 225 & 248 (1924)] to *Durio* on the basis that *D. oxleyanus* Griff. is intermediate in the 'critical' anther differences. Masters in 1874 (Hook. fil. Fl. Brit. Ind., **1**, 350 352) added the two Malayan species *D. malaccensis* Planch. ex Mast. and *Boschia griffithii* Mast., now *Durio griffithii* (Mast.) Bakh., and in 1875 (Journ. Linn. Soc. Bot., **14**, 499 503) described several more from collections by Beccari in Borneo. The first monograph of the genus however was by Beccari himself in 1889 (Malesia, **3**, 219-253 and plates 12 26), which deals principally with his own extensive Bornean collections. This is an excellent work but unfortunately several of the new species have been described on incomplete material, and this has been one of the causes of the present confusion in the genus. King in 1891 (Mat. Fl. Mal. Pen., **1**, 159-164 reprinted from Journ. Roy. As. Soc. Beng., **60**, 50 55) described the Malayan species and Ridley in 1922 (Fl. Mal. Pen. **1**, 261 265) included these together with three new species, two of which had previously been recorded as varieties. The first critical revision of the genus was done by Bakhuizen van den Brink in 1924 (*l.c.*, 224-231 & 248-253) who gave detailed separate keys of all species and of Indonesian species, but unfortunately he appears to have worked on a restricted amount of material and obviously did not see any of Beccari's important collections, and in many respects I consider he has unwittingly confused the position. He reduced the genus *Boschia* to the status of a section of *Durio* and of the then known or described Malayan species of *Durio* he reduced *D. singaporensis* Ridl. and *D. macrophyllus* Ridl. to *D. oblongus* Mast., and *D. pinangianus* Ridl. and *D. wrayi* King to *D. testudinarum* Becc., retaining only the following species *D. griffithii* (Mast.) Bakh. (syn. *Boschia griffithii* Mast.), *D. oxleyanus* Griff., *D. oblongus* Mast., *D. testudinarum* Becc., *D. malaccensis* Planch. ex Mast., *D. zibethinus* Murr., and *D. lowianus* Scort. ex King. Corner in 1939 (Gard. Bull. Str. Settl., **10**, 302-308) appreciating the confusion that exists in the Malayan species of the genus attempted to rectify it, but unfortunately he also did not see any sheets of Beccari's collections and although realising some of Bakhuizen van den Brink's errors has in attempting to correct them not succeeded in eliminating all confusion.

I have recently been fortunate in being able to get flowers and fruit, often from the same tree, of some of the species which have been causing the difficulties and confusing the issues in the Malay Peninsula. I have, as a result, raised again to specific rank some of the species previously reduced in addition to finding a few new records for the Malay Peninsula of species described from Borneo. However many more fertile collections, particularly in Perak, will be necessary to solve some of the remaining problems, particularly in respect of *D. macrophyllus* and *D. lowianus*.

The main difficulties of the genus *Durio* arise from the fact that many of the early species were described on incomplete material and on insufficient field notes at the time of collection, and that the leaf characters appear to be very variable within a single species. The position of the flowers whether born on the branches or trunk, the colour of the petals, whether the fruit opens on the tree or after falling on the ground, and the colour of the aril are all important diagnostic characters and unfortunately are too often omitted. The genus is certainly one that must be studied in the field if a proper appreciation of the specific differences are to be recognised. Another difficulty is that the fruits of a few of the species are considered as a great delicacy and widespread cultivation with improved breeding by selection, as with the mango (*Mangifera indica*) and rambutan (*Nephelium lappaceum*), resulting in the formation of races, has taken place. This has been carried out not only by the settled inhabitants but by the aborigines in the jungle with the result that cultivated or planted trees are found far in the depths of primary forest.

In the course of this study of the Malayan species of *Durio* I have of necessity examined in detail the Bornean species of Beccari; as a result several interesting points, which I am including in these notes, have come to light, as they may be of assistance to anybody who is revising the genus as a whole. Unfortunately I have only seen at Kew the duplicates of the type sheets, the originals being at the Istituto Botanico in Florence, and in many cases the duplicates are sterile; this however owing to Beccari's excellent detailed descriptions and drawings is not so serious a drawback. I have also unfortunately not seen the material in the herbarium of the Kebun Raya at Bogor (Buitenzorg) on which Bakhuizen van den Brink based his revision and critical study.

I wish to express my thanks to the Directors of the Royal Botanic Gardens at Kew and the Botanic Gardens at Singapore for putting their specimens at my disposal, to Prof. Dr. C. G. G. J. van Steenis of the Rijksherbarium, Leiden for his very helpful criticisms and to Dr. A. Kostermans of the Herbarium Bogoriense, Bogor for some notes on his recent *Durio* collections in East Borneo.

***Durio acuminatissimus* Merr.** in Philip. Journ. Sc. **24**, 393 (1926).

This species was described by Merrill on leaves and fruit only and even then without seeds and arils which are often characteristic in species of *Durio*. I have seen an isotype, Castro and Melegrito 1570, at Kew and the leaf is very like that of *D. zibethinus* Murr. and *D. kutejensis* (Hassk.) Becc. in shape and texture, but more like Wray 3684, holotype of *D. wrayi* King, which has been reduced to *D. lowianus* Scort. ex King. Merrill writes that *D. acuminatissimus* is well characterised by its slenderly and

abruptly subcaudate, acuminate, membranaceous leaves and it is interesting to note that the caudate-lanceolate leaves of *D. wrayi* are described by King (*l.c.*, 163) as being different from those of any other *Durio* of the Malay Peninsula. Personally I consider that the acuminate membranaceous and silver-scaled leaves of both these specimens to be atypical and those of saplings or adventitious and epicormic shoots; leaves of young saplings of *D. zibethinus* have these characters.

The spines of the fruit are similar to those found in *D. zibethinus* and *D. lowianus*.

I consider that it is extremely unlikely that this is a distinct species, but on the material available I am unable at present to reduce it to any specific species with certainty.

Durio acutifolius (Mast.) Wyatt-Smith, comb. nov.

Boschia acutifolia Mast. in Journ. Linn. Soc. Bot. **14**, 503 (1875).

Durio griffithii (Mast.) Bakh. var. *acutifolius* (Mast.) Bakh. in Bull. Jard. Bot. Buit., Ser. 3, **6**, 227 & 250 (1924).

This species was reduced by Bakhuizen van den Brink (*l.c.*, 227 & 250) to a variety of *D. griffithii* at the same time as he reduced the genus *Boschia* to *Durio*. Having seen at Kew duplicates of two of Masters' sheets, Becc. P.B.765 and Becc. P.B.2371, and a duplicate of Becc. P.b. 730 included by Beccari in his detailed description (*l.c.*, 256-257) I consider that this is a distinct species, the undersurface of the leaves being decidedly and consistently lepidote in contrast to the tomentose undersurface of the leaf of *D. griffithii*.

Collections—

North Borneo : Sandakan 3781 (Puasa-Angian).

Sarawak : Becc. P.B. 730 ; Becc. P.B. 765 ; Becc. P.B.2371 ; Hewitt s.n. (1908), Sapingket.

Dutch Borneo : Boschproefst. b.b. 11116 of 25.3.27.

Durio affinis Becc. in Malesia, **3**, 246-247 (1889).

I have seen a duplicate sheet of the type material, Becc. P.B. 852, of this species and agree with Beccari that it is distinct from *D. malaccensis*, where Masters had included it [Journ. Linn. Soc. Bot., **14**, 501 (1875)]. Bakhuizen van den Brink (*l.c.* 229) wrongly reduced this species to *D. testudinarum*, but although the material at Kew has no mature flower there is no doubt that it is distinct on leaf characters alone, even though I admit that leaf characters appear in general to be very unreliable in *Durio* species. Beccari distinguishes it from *D. testudinarum* in its ramiflorous flowers and the presence of scales on the outer face of the petals, *D. testudinarum* being cauliflorous and having no scales on the outer face of the petals. An examination of several flowering sheets of *D. testudinarum*, Haviland, 25 Oct. 1892 (Kuching), shows that *D. testudinarum* does frequently have a few scattered scales on the outer face of the petals near the tip, but the flowers invariably appear to be restricted to a collar around the base of the trunk only a few inches from ground level. Therefore until I have seen *D. testudinarum* in the field and found a wider range

of leaf shape and with occasional flowers on the branches, in which case an amended description of *D. testudinarum* would be necessary, I consider that *D. affinis* Becc. is a separate and distinct species.

Durio carinatus Mast. in Journ. Linn. Soc. Bot. **14**, 500 (1875) ; Beccari in Malesia, **3**, 238–240, plates 17 & 18 (1899).

Durio cupreus Ridl. in Kew Bull. 221 (1938).

Durio lissocarpus Mast. in Journ. Linn. Soc. Bot. **14**, 501 (1875).

This is a Bornean (and Sumatran, *vide* Bakhuizen van den Brink, *l.c.* 229 & 251) species which has not previously been recorded from the Malay Peninsula, though it appears to be quite common in the east coast swamp forest between Kuantan and Mersing. It is known at Kuantan as *durian burong*.

A full description is as follows, the petals which are twisted before opening appearing to be a distinctive character :—

Moderately large (about 100 ft. tall) unbuttressed tree with silvery-pink rough scaly bark, large white corky lenticels at base of trunk. *Slash* thick powdery pink outer bark, and deep red laminated inner bark. *Leaves* 9–12 by 3–5 cm., ovate, rounded to cuneate base, narrowed to apex or apiculate, coriaceous, very small closely adpressed pale yellowy brown scales on lower face, glabrous upper face dries greeny grey, midrib grooved on upper face, secondary venation faint and indistinct, petioles 10–13 mm. long, scaly. *Flowers* on old branches and twigs behind leaves in 7–10 cm. long many-flowered cymes ; buds ovate-oblong frequently with small mucronate tip ; pedicel stoutish 1 cm. long, scaly ; epicalyx pale silvery brown covered with small closely adpressed scales, splits irregularly ; inner calyx covered with pale straw coloured large scales 1.5 mm. in diameter, tubular with 5 small teeth at mouth ; petals yellowish, twisted before opening, 3 cm. long, lanceolate, narrowed to base, inner face glabrous, outer face finely tomentose ; stamens 3 cm. long overall, phalanges joined in a pentagonal shaped tube, 1.5 cm. long, and then rapidly breaking up into many filaments with several anthers in each head ; style up to 4 cm. long, grey tomentose, scaly at base. *Fruit* immature, 5.5 cm. by 4 cm., densely armed with 13–14 mm. long slightly curved sharp stiff spines ; mature, pale orange yellow, 13 cm. by 8 cm., densely armed with 13–15 mm. long slightly curved stiff pyramidical spines, splits into 5 segments on the tree ; seed smooth, glossy black to very dark brown, completely covered with bright red aril, except where it is attached which is creamy yellow.

Collections—

Johore : Kep. 71316 (Wyatt-Smith).

Pahang : Kep. 6653 (Mahmud) ; Kep. 31613 (Awang) ; Kep. 43201 (Jaamat and Sow) ; Kep. 65663 (Setten) ; Kep. 65665 (Setten) ; Kep. 65668 (Ismail) mature fruit.

Durio conicus Becc. in Malesia, **3**, 241–242 (1889).

Duplicate material of both syntype sheets, Becc. B.P. 2589 and Becc. P.B. 2563, are available at Kew, but in neither case is young or mature flowering material present.

This species, described from collections in Sarawak, is characterised by the staminal phalanges being free to their base and with some filaments being entirely free. In other flower characters, leaf and fruit it resembles, if it is not identical with, a Malayan species, *D. lowianus* Scort. ex King, though *D. lowianus* has I consider red petals and *D. conicus* white petals. *D. conicus* is said by Beccari to have persistent petals (*diu persistentibus*), but his drawing (*l.c.* plate 25, fig. 5) shows a very young fruit without persistent petals, although both the inner calyx and epicalyx are persistent, and this is also the case in the available material at Kew. There is no suggestion in his drawing of a mature flower (*l.c.* plate 25, fig. 3) that any of the staminal filaments are free, which is his key character for the species, and I consider that it is most probable that the phalanges and staminal filaments, if lightly united at the base, would necessarily separate in a flower in which the fertilised ovary was developing. I should like therefore, before deciding finally, to see the type material at Florence which should have buds and flowers, the duplicate sheets at Kew only have very young fruit and the remains of a single flower on each sheet, but I consider that it is possible that *D. lowianus* is a red flowered variety of *D. conicus*, the latter name taking precedence, but that the description should be emended in respect of its staminal character.

Difficulty has arisen owing to the absence of notes on the colour of petals in many of the Malayan collections placed by me under *D. lowianus*, though in the few cases it is mentioned it has been bright red (Kep. 51671), pink (Wray 3684), blood red (Sing. 12579), rose (Ridley s.n. May 1896) and rose red (Sing. 33421). Ridley (*l.c.*, 261) however places *D. lowianus* in his key in the section with white flowers, though King (*l.c.*, 163) when describing the new species does not mention the colour of the petals and there is no note on their colour on the type sheets, Scortechini 1767 (interpreted and written erroneously as 1969 by King), which is the only sheet cited. Ridley only cites two collections in his description, the type sheet and Kedah, Yan (Haniff), which is almost certainly Sing. 12579, and which has a note "petals blood red".

A recent collection (Kep. 57451) in Trengganu (east Malaya) near the coast, however, has creamy-white petals, the first instance that I can find of a collection in Malaya resembling *D. lowianus* with definite white petals. It is a common large tree in Bukit Bauk Forest Reserve. The flowers arise mainly from the branches, but with a few from the trunk, on cymes 3-5 cm. long; pedicels 2.5-3 cm. long; epicalyx usually splits into two irregular parts; inner calyx cup-shaped with irregular edge and recurves slightly as flower matures, covered with pale yellow brown to cream coloured large loosely attached scales; petals creamy-white, spatulate, tapering to a narrow 'stalk', nearly glabrous inner face, tomentose outer face, 3.5 cm. long, 1 cm. at its broadest; stamens 4.5-5 cm. long overall, slightly tomentose, arranged in 5 phalanges lightly joined at the base; style about 5 cm. long, tomentose. The leaves are 12-19 cm. long by 4.5-7 cm. wide, oblong, rounded base, shortly and abruptly apiculate, glabrous above, lower surface covered with small closely adpressed pale silvery or yellowish brown scales with characteristic dark centre, venation about 15, fairly clear on both faces; petiole 1.3-1.8 cm. long. Mr. J. Sinclair in a visit to Trengganu in July 1953 found another tree of this species in flower (Sing. 39835). In his collec-

tion there is a portion of an old fruit and this has 2 cm. long slightly curved sharp stiff narrow spines which are swollen at the base and covered with very small silvery scales.

I am taking this species to be what Beccari described as *D. conicus* and have placed it there accordingly, this being the first record of *D. conicus* in the Malay Peninsula.

Durio cupreus Ridl. in Kew Bull. 221 (1938).

I have examined at Kew the type, and only sheet (Haviland 1803) of this species. Ridley describes it as having free stamens like *D. lanceolatus*, but as he himself states the only advanced bud seen is not fully developed. Ridley states that the species is quite distinct from any other in its ovate cuspidate-acuminate leaves, which are very coriaceous and with almost completely invisible nerves; in this respect however it is similar to *D. carinatus*, which has been found in Borneo and on the east coast of Malaya, but this has its stamens joined in a tube and the flowers in corymbose inflorescences with long peduncles in contrast to the few flowered inflorescences with short peduncles of *D. cupreus*. On the sheet at Kew there is a remnant of an overmature flower showing the developing fruit and it is interesting to note that there is a remnant of a tubular calyx, as found in *D. carinatus*, still present. It is also interesting to note that in the only advanced bud present the petals are twisted, a key character for *D. carinatus*. Further on close examination of a cross-section of the androecium I do not agree with Ridley that the staminal filaments are free, they are definitely united into phalanges in a tube. *D. cupreus* must therefore be deleted and be added to the synonymy of *D. carinatus*.

Durio dulcis Becc. in Malesia, 3, 243-244 (1889).

A duplicate of the type sheet, Becc. P.B. 2921, is available at Kew but it is unfortunately sterile. The differences between this species and *D. graveolens* Becc. (*l.c.*, 242-243) are small, Beccari distinguishing them on the leaves of this species being apiculate and having closely adpressed scales, and on the thickness of the valve of the fruit which he gives as 10-15 mm. in *D. dulcis* and 5-6 mm. in *D. graveolens*. Beccari did not see flowering material of either species, and both of them were described from single collections. Although I have not seen the fruits of either of Beccari's species I am convinced that both are one and the same species, particularly as collections in Malaya, of what I take to be this species, have slightly apiculate leaves but which in every other respect are identical with *D. graveolens*. Bakhuizen van den Brink (*l.c.*, 230) doubtfully reduced both these species to *D. conicus* Becc. I do not agree with this but I do consider that both *D. dulcis* and *D. graveolens* are the same and that one of the two species should be reduced and I have selected *D. graveolens* as the name that should be retained.

Kostermans, who has seen this manuscript, is doubtful whether *D. dulcis* should be reduced. He has collected in East Borneo material of a red durian, called locally by the name of *lahong*, which he considers is *D. dulcis* Becc. He writes 'In living material of the red durian (*lahong*) (= *Durio dulcis* Becc.) the spines are numerous, long, but not curved. The thickness of the fruit-valve is 15 mm. and more. The arillus is

yellow and completely envelopes the chestnut brown seed. It is more fragrant than *D. zibethinus*. The fruit hang on the horizontal branches, and fall unopened. The tree is large (up to 40 m.) with large buttresses The flowers are comparatively small and white.'

Durio gratissimus Becc. in Malesia, **3**, 244, plate 22 (1889).

Beccari described this species on a fruit brought to him by a native, which was said to taste better than any other wild durian. The fruit was characterised by the shape of the spines, the size of the fruit and the small number of seeds per loculus I agree with Bakhuizen van den Brink (*l.c.*, 228) that it is most probably nothing more than the fruit of *D. oxleyanus*. Unfortunately I have not seen the fruit of *D. oxleyanus* in the field and so do not know whether it has a fleshy edible aril which completely encloses the seed.

Durio graveolens Becc. in Malesia, **3**, 242, plate 26 (1889).

Durio dulcis Becc. in *l.c.*, 243-244.

This Bornean species of Beccari is based on his own collection P.B. 3088 which had previously been included by Masters in *Journ. Linn. Soc. Bot.*, **14**, 500 (1875) in *D. oblongus* Mast. Masters also included P.N.2921 which Beccari removed and made it his type for *D. dulcis*. Beccari was right, I consider, in removing them both from *D. oblongus* but I do not consider he was correct in making them both separate new species (see also my comments under *D. dulcis*). Both species are based on fruiting specimens only, no flowering material being present, and no differences in the fruit seem to be present, and no differences in his descriptions apart from the thickness of the valve wall. Only leaves are available at Kew on the isotype sheets, and there is no doubt that at first glance they appear to be different in degree of scaliness and colour of scales on the under-surface in addition to the leaf apex differences mentioned by Beccari. However I have not found degree of scaliness to be a reliable character with *Durio* species, and in my opinion both these species are one and the same; I am selecting the name *D. graveolens* as the preferable one as the leaves in P.B. 3088 represent I consider the average leaf shape of the species.

This species has not been recorded previously from the Malay Peninsula but material has been collected on several occasions which is, I consider, identical on leaf and fruit characters with *D. graveolens*. Several trees occur by the side of the Ginting Simpah road at the 14th mile in Ulu Gombak Forest Reserve, Selangor, and buds, flowers and fruits have been obtained. Owing to flowers not having been described before a full description of the species based on material, Kep. 65524 and Kep. 65525 is given below.

A moderate-sized to large tree with smooth to flaky reddish brown bark; buttressed; young twigs characteristically covered with large loosely attached scales; linear stipules 1 cm. long frequently semi-persistent. *Leaves* 11-15 by 5-6.5 cm., oblong, rounded base, shortly and abruptly apiculate apex, glabrous above, sometimes with stellate hairs, lower surface covered with closely adpressed dull brown scales; petiole

1.5–2.0 cm. long. *Flowers* on the branches, in short cymes : bud egg-shaped, slightly pointed ; pedicels 10–13 mm. long ; epicalyx splits usually into two irregular parts, covered with closely adpressed scales, recurves as flower matures and is persistent ; inner calyx splits irregularly and incompletely into about three for about half its length and assumes a saccate shape at the base in open flowers, covered with large, 1.5 mm. diameter, closely adpressed scales ; petals white, 2.5 cm. long, 1 cm. across, spatulate, glabrous inner face, tomentose outer face ; stamens 2.5–3 cm. long overall, arranged in 5 free phalanges ; style about 2.5 cm. long, tomentose, with yellow stigma. *Fruit* globose, about 11 cm. in diameter including length of spines, orange red when mature, spines 2 cm. long curved flecked with red scales, peduncle 2.5 cm. long, fruit which is usually erect splits easily into 4–5 segments on tree, epicalyx, inner calyx and stamens persistent ; seed chestnut brown, non angular, completely enclosed with an orange aril, said to be edible.

Collections—

Johore : s.n. (Corner, 7.2.35 ; S. Sedili) ; s.n. (Corner, 30.5.37 ; 12th mile, Masai Jemaluang road) ; Kep. 69913 (Burgess).

Kedah : Kep. 7707 (Noordin) ; Kep. 60487 (Md. Salleh).

Malacca : Derry 1208.

Negri Sembilan : Kep. 64001 (Mohamed Nor).

Penang : s.n. (Curtis, Jan. 1900 ; Govt. Hill, near cooly lines).

Perak : Kep. 039 (Barnard) ; Kep. 8832 (Jinal) ; Kep. 11037 (Hamid) ; Kep. 16766 (Suoh).

Selangor : Kep. 399 (Hashim) ; Kep. 1233 (Foston) ; Kep. 7913 (Foxworthy) ; Kep. 9997 (Hamid and Awang) ; Kep. 13392 (Strugnell) ; Kep. 24970 (Hamid) ; Kep. 28944 (Md. Jusus) ; Kep. 65524 (Wyatt-Smith) ; Kep. 65525 (Wyatt-Smith) ; Kep. 65526 (Wyatt-Smith) ; Kep. 66206 (Sabeh) ; Kep. 71369 (Wyatt-Smith).

Singapore : s.n. (Kiah, 24.8.40 ; Mandai road).

Durio griffithii (Mast.) Bakh. in Bull. Jard. Bot. Bukit., Ser. 3, **6**, 227 & 250 (1924) *pro parte*.

Boschia griffithii Mast. in Hook. fil. Flor. Brit. Ind. **1**, 352 (1872) and in Journ. Linn. Soc. Bot. **14**, 503 (1875).

This species was first described by Masters as *Boschia griffithii* : Bakhuizen van den Brink *l.c.*, 227, reduced the genus *Boschia* to *Durio* but in so doing also reduced the species *Boschia acutifolia* Mast. to a variety of *D. (Boschia) griffithii*. This I consider is incorrect, *Durio (Boschia) acutifolia* being distinct from *D. griffithii*, which has a tomentose under surface to the leaf, that of *D. acutifolia* being decidedly lepidote.

Durio kutejensis (Hassk.) Becc. in Malesia, **3**, 251 (1889).

Lahia kutejensis Hassk. in Cat. Hort. Bog. ed. nov., 100 (1858).

The description by Hasskarl is based on a species from the bank of the river Kutei near Samarinda on the east coast of Borneo collected by C. de Groot. The key characteristic of the plant is the completely free filaments of the stamens, which rarely branch. Kostermans of Bogor writes that

D. kutejensis is cultivated everywhere along the Mahakam river, especially, near Samarinda, that it is not in a wild condition, and that Hasskarl's type specimen was undoubtedly also from a cultivated specimen.

Beccari never saw the type sheet but saw a specimen collected by Teysmann in 1867 for him from a cultivated tree in the Botanic Gardens at Bogor (Buitenzorg).

There are two sheets at Kew both from cultivated trees at Bogor. Bakhuizen v.d. Brink 5317 of 2.4.21 and van Slooten 824 of 26.7.28, which fit the description of this species, but it never seems to have been collected again. Other sheets at Kew identified as this species certainly do not belong to it.

Durio kutejensis Hassk., Becc. forma **kinabaluensis** Bakh.

There are several sheets Clemens 26816, 27442, 30366, at Kew, which were collected by Clemens in 1931 from Mount Kinabalu in North Borneo and which bear the name *D. kutejensis* Hassk. Becc. forma *kinabaluensis* Bakh. This form has never been published. This is fortunate as I do not consider that it is at all a form of *D. kutejensis*, the key character for which is *free* staminal filaments. An examination of Clemens 27442 shows the presence of 5 distinct phalanges but admittedly with apparent occasional free filaments in between, and I am definitely of the opinion that these sheets represent an undescribed species.

Durio lanceolatus Mast. in Journ. Linn. Soc. Bot. **14**, 499 1875 ; Beccari in Malesia, **3**, 250-251 (1889).

The holotype of this species by Masters is Becc. P.B.2610 of which there is fortunately a duplicate or ? holotype at Kew. Masters describes the androecium as being tubular at the base *androecio ima basi tubulato* and again later *androecium e staminibus phalangibus 5 plurivanosis infra medium inseparatis, tubumque efformantibus, constans* whereas Beccari, quoting the same number and in an enlarged description gives the stamens as being free *staminum filamentis omnino liberis* and again later in Italian *a contatto fra di loro alla base, ma quasi tutti distinti*. I have examined flowers from the sheet ? holotype at Kew and there is no doubt that Masters' description is correct, the stamens being united into 5 quickly dividing phalanges which are lightly united at the base. This error (?) of Beccari has unfortunately crept into subsequent interpretations of *D. lanceolatus*, c.f. Ridley, Kew Bull., 221 1938 in his description of *D. cupreus* Ridl.

I have examined the sheet, Ridley 15595 (Selangor), on which Ridley (l.c., 263) bases the occurrence of this Sarawak species in Malaya and I agree with Corner (l.c., 308) that it should be deleted; I consider that the material is a small narrow leaved form of *D. singaporensis*, the characteristic bracteolate clusters of flowers being distinctive.

Durio lissocarpus Mast. in Journ. Linn. Soc. Bot. **14**, 501 1875.

After examination of the duplicate material at Kew of the type sheet of *D. lissocarpus*, Becc. P.B. 427, and of the type sheets of *D. carinatus* Mast., Becc. P.B. 600 and Becc. P.B. 3086, I entirely agree with Beccari in reducing this species to *D. carinatus*.

Durio lowianus *Scort. ex King* in *Mat. Fl. Mal. Pen.* **1**, 161 (1891).

Durio wrayii King in *l.c.*, 163.

Durio zibethinus Murr. var. *roseiflorus* Corner in *Gard. Bull. Str. Settl.* **10**, 303 (1939).

I entirely agree with Corner in uniting *D. wrayii* and *D. lowianus*, Bakhuisen having reduced *D. wrayii* to *D. testudinarum*. King in describing *D. wrayii* (Wray 3684) states that the caudate-lanceolate leaves of the specimen are different from those of any other *Durio* of the Malay Peninsula; in my opinion, however, the *thin texture* of the leaves, the thin adpressed silvery scales on the lower surface, the *caudate acuminate* apex and the *long internodes* suggest that the leaves of this specimen are those of an immature, epicormic or adventitious shoot, certainly the leaves of a young seedling of typical *D. lowianus*, Kep. 13018 (seedling, mature leaf and fruit), are identical with those of Wray 3684 (cf. *D. acuminatissimus*, *D. sumatranus*).

I cannot agree with Corner in making it a variety of *D. zibethinus*. The flower admittedly has a similar structure to that of *D. zibethinus*, and leaves are frequently indistinguishable, but in no case, even taking Corner's figures of the analysis of the flowers, is there any overlap, and the fruits are decidedly different being smaller and having longer and more slender spines. I prefer therefore to give it specific status and have chosen the name of *D. lowianus* in preference to *D. wrayii*, both species having been described at the same time in 1891, as the leaves of the type sheets of the former represent more the average leaf shape for the species.

This is a red flowered species (see discussion under *D. conicus*) and is widely distributed in lowland forest in the Malay Peninsula, and I consider that it is possible that it is a red flowered variety of the Bornean species, *D. conicus* Becc., which is in fact an older name. Before reducing *D. lowianus* however I shall have to see the type material of *D. conicus* at Florence and preferably also fresh flowering material of *D. conicus* or *D. lowianus* in the field in Borneo, as I consider that there is a possibility that Beccari made an error of critical importance in his description (see under *D. conicus*).

Collections—

Johore : Kep. 70090 (Latiff).

Kedah : Sing. 12579 (Haniff).

Kelantan : Sing. 33421 (Corner; type of *D. zibethinus* var. *roseiflorus*).

Negri Sembilan : Kep. 0629 (Tahir).

Pahang : Kep. 4611 (Hamid); Kep. 4860 (Hamid); Kep. 5490 (Hamid); Kep. 5491 (Hamid); Kep. 31700 (Debab); Kep. 49818 (Symington); Sing. 17270 (Burkill and Haniff).

Perak : Scortechinii 1767; Scortechinii s.n. (co-type, at Kew); Wray 3684 (type of *D. wrayii*); Kep. 8834 (Jinal).

Selangor : s.n. (Ridley, May 1896, Bt. Hitam) Kep. 4596 (Abu); Kep. 12079 (Omar); Kep. 13018 (Strugnell); Kep. 24965 (Hamid); Kep. 44943 (Jaamat and Tachun); Kep. 51671 (Symington); Kep. 63610 (Salleh).

Trengganu : s.n. (Corner, 29.4.37, Kuala Berang).

In addition to the above collections I am provisionally placing under *D. lowianus* the following sheets. They are those of a large species of *Durio* which appears to be common on hill slopes, in certain areas (Ulu Benus, Bentong) up to 3000 ft. None of the sheets have flowering material, and only two fruit, immature (Kep. 10450) or bits of old fruit (Kep. 30740). They are characterised by the *small*, oblong shaped leaf, 8–12 cm. long by 2–3.5 cm. broad.

Collections—

Kedah : Kep. 59642 (Nasruddin).

Pahang : Kep. 51830 (Symington).

Perak : Kep. 10421 (Hamid) ; Kep. 10450 (Foxworthy) ; Kep. 30740 (Symington) ; Kep. 40796 (Symington) ; Kep. 51201 (Abu Manap).

***Durio macrophyllus* (King) Ridl.** in Fl. Mal. Pen., **1**, 264 (1922).

This species was originally described by King (*l.c.*, 53) as a variety, *D. testudinarum* Becc. var. *macrophyllus*, on two sheets, Kunstler 7497 and Wray 3397, both from Upper Perak. His description was as follows :— ‘Leaves 10 to 17 in. long, 2.5 to 5.5 in. broad, the edge sometimes with a single shallow indentation. Racemes 3 in. long, many flowered, with numerous bracteoles’ and ‘No fruit of this variety has as yet been collected.’

Ridley (*l.c.*, 264) promoted it to a distinct species, *D. macrophyllus* (King) Ridl., and gave a comparatively detailed description in which he stated that the petals are white and that the tree flowers on the trunk in cymes. He omitted Wray 3397 in his citation of species, although both sheets of this number at Kew are identified as *Durio macrophyllus* Ridl. in Ridley’s own handwriting, but added a) Goodenough 1993 (Malacca, Hulu Belankan) which I consider is typical *D. malaccensis*, b) Maxwell’s Hill, presumably Ridley 5352, which may be *D. pinangianus* and c) Curtis 2731 (Dindings, Lumut ; collected by Derry). The distinctive characters as defined by Ridley are the large leaves (they are small in Ridley 5352) with a rounded base and with a dense cover of large fimbriate scales on the under-surface, flowers on the trunk in cymes, petals waxy white.

Bakhuizen van den Brink (*l.c.*, 229) reduced the species to *D. oblongus*.

Corner (*l.c.*, 307) drew attention to the difference in petal colour, waxy white (Kunstler 7497) and rose red deepest at the tip (Wray 3397) and in accordance with his interpretation of *D. testudinarum*, which he mistakenly thought to have red petals (see my comments under *D. testudinarum* Becc.), placed Curtis 2731, Wray 3397 and Sing. 29542 (Henderson) in his *D. testudinarum* var. *macrophyllus*. He admitted that Kunstler 7497 with white flowers baffled him and also Kep. 0127 (O’Hara) and Kep. 5621 (Awang), but he believed that they should be referred to *D. oblongus*.

The two type numbers of *D. testudinarum* var. *macrophyllus* King present the initial problem with the following notes :—

Wray 3397 ‘Smallish tree, flowers on trunk near ground, leaves bright shining green, beneath pale silvery dotted with pale brown veins, flower petals rose red, deepest at tips, under-surface with a few shining scales, calyx cream with shining pink scales, within cream colour, column pink, anthers cream.’

Kunstler 7497 'A magnificent durian tree 50 to 60 ft. high ; stem 15 to 24 inches d. (diameter ?). Leaves rich dark green, glossy light brown beneath. Flower grand, inner petals pale waxy white sprinkled with silvery spots, lower petals pale green white covered with silvery scales, calyx silvery pale green with light brown spots, stamens white, pistil yellow waxy.'

There is no doubt that there is a strong and very striking resemblance between these two collections if the field notes are ignored, the leaves in both are large, they have a shallow and characteristic indentation along the edge of the lamina, a caudate base, a grooved midrib on the upper face and similar type of scales on the under-surface, but the most striking similarity in these two collections is the inflorescence and the large persistent floral bracts which I have not found in any other species of *Durio* except *D. singaporensis*. The flowers of both specimens from the Kew sheets have long staminal columns, 4 cm. in Wray 3397 and 5 cm. in Kunstler 7497, densely tomentose and scaly styles, an inner calyx that splits to the base and petals with a glabrous inner face and a pubescent scaly outer face, but the petals in Wray 3397 are more scaly and shorter in length although both are of the same shape. Wray mentions in his notes that the tree flowers on the trunk near the ground ; this is an unusual character and yet such a striking one that the lack of reference by Kunstler to the position of the flower, taking into account his comparative detailed notes in other respects, leads me to consider that it was likely to have been from the branches in his tree as in the common cultivated durian, *D. zibethinus*, and the common jungle durian, *D. lowianus*.

Of Ridley's extra sheets included in his definition of *D. macrophyllus* Ridl. Curtis 2731 appears identical in floral characters with Kunstler 7497, large persistent bracts again being present, but although the leaf is also large the scales on the under-surface are larger and very loosely attached and the venation is very indistinct. Unfortunately neither the colour of the petals nor the position of the flowers are given. Curtis 2731 also has characteristic 2.5 cm. long semi-persistent linear lanceolate stipules which occur in Wray 3397 and Kunstler 7497.

Of other collections there is no doubt in my mind that King 3146, Kep. 0127, 4604 and 5621 are one and the same species, and in the under-surface of the leaf, the semi-persistent linear stipules, length of petal (Kep. 0127), sparse scaliness of the back of the petal (Kep. 0127, 4604), length of staminal column (Kep. 0127, 4604) and scarcely pointed bud (Kep. 5621) that they are identical with Kunstler 7497 ; King 3146 however has a much shorter 3 cm. long, staminal column and petals. It is unfortunate that again no detailed field notes are available and so one is left to wonder at the colour of the petals and position of the flowers ; the vernacular name however for all three Kepong collections is given as *durian daun*. This definitely suggests that the flowers are in the crown of the tree, as the vernacular name would almost certainly I consider have been *durian tanah* (the ground durian) or *durian batang* (the trunk durian), names which I have been given for species with characteristic flowering from the tree trunk.

Kep. 45499 is a smallish tree with a very scaly under-surface to its leaves and the field notes state that it flowers on tubercles near the base

of the trunk. There is no complete flower present, but the solitary petal is only just over 4 cm. long and has some scales on the outer face and the staminal column is of the same length. This sheet appears to be the same as Wray 3397.

Sing. 29542 is also a small slender tree and in leaf characteristics, stipules and position of flowers ('Fruit in tubercles, mostly about 1 ft. from ground, some from about 2 ft. Fruits 5 angled, blue green Aril white, seed white.' M. R. Henderson) is identical with Wray 3397. The fruit is very similar to that of Kep. 65539 which I have placed in *D. malaccensis*.

I have recently (May 1953) seen in the field in Segari-Melintang Forest Reserve in the Dindings (Perak) two fertile trees from one of which collection Kep. 69431 (flowers and young fruit) have been made. This is undoubtedly *D. macrophyllus* as are two other fertile collections (Kep. 69409 and Kep. 69430) made in the same neighbourhood by local field staff. All these trees had creamy white flower petals, and their flowers arose mainly from the branches with a few also from the stem or trunk. The flowers are large and are characterised by their long staminal phalange tube; an analysis of 36 flowers picked up from the ground below Kep. 69431 gave the following results for length of staminal tube—4 cm. (1), 4.5 cm. (3), 5 cm. (8), 5.5 cm. (13), 6 cm. (8), 6.5 cm. (2), 7 cm. (1). The leaves are also exceptionally big for a *Durio* species, up to 40 cm. long and 15 cm. wide, and have large golden brown scales on the lower surface. The large semi-persistent stipules are also characteristic.

As neither King nor Ridley describe the fruit, and the position of the flowers (based presumably on Wray 3397) is given by Ridley (it is not stated by King although Wray 3397 is one of two cited numbers) as 'on the trunk in cymes', I am including an emended description as follows, and based largely on Kep. 69409, Kep. 69430 and Kep. 69431, of what I consider to be its chief characters:—

A small to medium sized tree with small buttresses, pale grey fawn smooth slightly lenticellate bark and salmon-pink slash. *Leaves* 20–40 by 5.5–15 cm. wide, oblong, shortly to very shortly acuminate, base rounded to slightly cordate, large golden brown fimbriate scales on under-surface, glabrous upper-surface, midrib grooved on upper face; petiole 1.5–3.5 cm. long; stipules frequently semi-persistent. *Flowers*: mainly on the branches and occasionally from the stem in short cymes on burrs, bud egg-shaped, pedicel 1.5–2 cm. long, floral bracts semi-persistent; epicalyx splits into two, covered with dull brown fimbriate scales, about 3 cm. long; inner calyx 3–3.5 cm. long, top half splits into 5, lower half fused and saccate, outer face covered with large golden-brown fimbriate scales; petals creamy white (? also pinky-red, Wray 3397), elongated, narrowed to base but with wing-like or auriculate structure for lower third of length, 6 cm. long by 1.4 cm. wide, outer face covered with stellate hairs and a few large fimbriate scales, inner face glabrous; stamens 8–9 cm. long overall, in 5 phalanges joined in a tube for 5–6 cm.; style 9 cm. long, stout, densely tomentose. *Fruit*: (from immature fruit) globular, 6 cm. diameter blue-green, set with sharp stout pyramidal spines 7–8 mm. long, epicalyx semi-persistent; seed completely covered with thin creamy-white aril, seed smooth pale creamy-yellow.

Collections—

Kelantan : Sing. 29542 (Henderson).

Pahang : Kep. 1296 Mat Nong ? : Kep. 23482 (Sayed Ali) : Kep. 45499 (Symington) ?

Perak : Kunstler 7497 : Wray 3397 : Curtis 2731 : Ridley 5352 : King 3146 ; Low 821 ? ; Kep. 0127 (O'Hara) ; Kep. 4604 O'Hara : Kep. 5621 Awang : Kep. 8836 (Jinal) : Kep. 69409 Ismail : Kep. 69430 Ismail : Kep. 69431 Ramli 27.4.53 ; Wyatt-Smith 27.5.53).

I confess that I am not at all happy with this species and further collections may well show that the collections above comprise two or more distinct species, and that Kunstler 7497 and Wray 3397 are different. In floral structure this species is closely related to *D. pinangianus*.

Durio malaccensis Planch. ex Mast. in Hook. fil. Fl. Brit. Ind. **1**, 351 (1874).

Masters' original description of this species was based on specimens collected by Maingay Maingay 218 and Griffith several unnumbered sheets in the Malay Peninsula. He subsequently [Journ. Linn. Soc. Bot. **14**, 501 1875] in a paper on specimens of *Durio* collected by Beccari in Borneo included three sheets, Beccari P.B. 852, 2190 and 2590. Beccari, quite rightly, removed [Malesia, **3**, 237 1889] these latter sheets and distinguished them as new species, *D. affinis* P.B. 852 and *D. testudinatum* P.B. 2590, reserving for *D. malaccensis* those specimens collected in the Malay Peninsula. Ridley *l.c.*, 262 maintained the species but erroneously included a lot of sheets which are not of this species and his description is therefore at fault. Bakhuizen van den Brink (*l.c.*, 229) retained the species in his revision of the genus. Corner (*l.c.*, 304) correctly recognised Ridley's errors but erroneously stated that *D. malaccensis* had never been found again, and that he thought that 'it is really no other than *D. sibethinus*, or a variety so rare that it is scarcely to be reckoned with the common wild durians of Malaya.' This is far from being the case, the species having in fact been collected several times as follows :—

Sing. 10295 (Holttum)—Gunong Blumut, Johore.

Sing. 9773 Holttum—Negri Sembilan 'Masses of flower buds and a few leafy shoots at base of trunk. Red fruit collected later. Tree frequent in part of the forest'.

Kep. 5913 (Rahim)—Kemidak, Johore ('Red fruit').

Goodenough 1993—Ulu Slangkan, Malacca 'Fruit at foot of tree'.

I agree with Beccari therefore that *D. malaccensis* is a good species and as he never saw the fruit I include what I consider are its chief characters as follows :—

A moderate sized tree. *Leaves* 15–23 by 4.5–7.5 cm., lanceolate-elliptic to suboblanceolate-oblong, rounded to cuneate base, abruptly acuminate at the apex, thin texture, silvery brown lepidote under-surface, glabrous upper surface drying reddish brown, midrib grooved on upper face, secondary venation very finely distinct ; petiole 1.5–2 cm. long. *Flowers* on burrs at base and a little up the trunk, bud oval shaped,

strongly pointed, pedicel 1.5 cm. long stout; epicalyx splits into two, covered with closely adpressed small brown scales; inner calyx split into 5 segments, densely covered with yellow brown scales 1.5 mm. wide on the outer face; petals 5-6.5 cm. long, glabrous inner face, pubescent and slightly scaly outer face; stamens 4.5-6 cm. long overall occasionally up to 9 cm., 5 phalanges joined in a tube for half their length and then dividing with filaments separating off at intervals; style 8 cm. long, tomentose with scales towards base. *Fruit* globular, 7-9 cm. across, red, set with sharp stout spines 7-10 mm. long, peduncle 4.5 cm. long, seed large covered with aril for half to two-thirds.

In 1949 I found in Bukit Lagong Forest Reserve, Selangor, several trees of a species which in floral characters appears to be identical with *D. malaccensis* and with very similar leaves and fruits but the secondary venation is very much more distinct on the lower face than in typical *D. malaccensis* and is markedly looped, and the apparently mature fruits are green, not red, and armed with shorter and stouter spines or pyramidal shaped warts. The petals are creamy white and the flowers occur in small clusters on tubercles from the base of the trunk up to the main branches and occasionally even on the main branches. The seed is brown, rough, with a non fleshy inedible ivory white aril which covers only the top half of the seed. I am convinced however that these trees belong to *D. malaccensis* or possibly represent a variety. Previous collections from Selangor and Trengganu agree with this variety.

Collections—

Selangor: Kep. 13701 (Foxworthy and Burkill); Kep. 13903 (Strugnell); Kep. 52217 (Motan and Sow); Kep. 64410 (Wyatt-Smith); Kep. 64878 (Wyatt-Smith); Kep. 64879 (Wyatt-Smith); Kep. 64893 (Wyatt-Smith); Kep. 65539 (Wyatt-Smith).

Trengganu: Sing. 33393 (Moysey and Kiah); Sing. 33606 (Moysey and Kiah).

Durio oblongus Mast. in Journ. Linn. Soc. Bot. **14**, 500 (1875); *emend.* Beccari in Malesia, **3**, 248-249 (1889).

I agree with Beccari in removing Becc. P.B. 3088 (type of *D. graveolens* Becc.) and Becc. P.B. 2921 (type of *D. dulcis* Becc.) from *D. oblongus* Mast., but I do not consider that P.B. 3088 and P.B. 2921 are different (see under *D. dulcis* and *D. graveolens*).

Durio oxleyanus Griff. in Calc. Journ. Nat. Hist. **5**, 115 (1845).

Durio gratissimus Becc. in Malesia, **3**, 244 (1889).

This is a very distinct species which is easily recognisable by its medium sized to large oblong shaped leaves which are characteristically pubescent or hairy on the under-surface, only being slightly scaly on the midrib, and the fruit which has 2 to 3 cm. long stout woody spines.

Durio pinangianus (Becc.) Ridl. in Fl. Mal. Pen. **1**, 264 (1922).

This species was originally described by Beccari (*l.c.* 246) as *D. testudinarum* var. *pinangianus* Becc. Ridley raised it to specific rank, but it was then reduced again by Bakhuijzen van den Brink (*l.c.* 229), which Corner (*l.c.* 308) also agreed to.

I do not agree that it is only a variety of *D. testudinarum* there being sufficient differences to justify raising it to specific status as Ridley did. The colour of the petals is pink, they are broad or rounded at the base and sparsely covered with scales for the whole of the outer face, whereas in *D. testudinarum* the petals are white, they are narrowed to the base and scales are either absent or only sparsely present at the tip of the outer face. The fruit of *D. pinangianus*, which Beccari never saw, has longish thin spines as in *D. malaccensis*, whereas that of *D. testudinarum* according to Beccari's drawing (*l.c.*, plate 14) has short sharp pyramid-shaped spines or warts. The flowers in *D. pinangianus* are produced on burrs from the trunk, generally near the ground, whereas in *D. testudinarum* they appear always to form a collar only a few inches from the base of the trunk.

Collections—

Penang : Curtis 293 (type) ; s.n. (F. Gd., May 1893, Govt. Hill) ; Sing. 3328 (Burkill) ; Sing. 3339 (Burkill) ; ? Sing. 3700 (Haniff) ; Sing. 3780 (Haniff).

Perak : Ridley 9572 ; ? Kep. 0113 (O'Hara) ; Kep. 32258 (Symington) ; ? Kep. 33769 (Arnot).

Durio singaporensis Ridl. in Journ. Roy. As. Soc. Str. Br. **73**, 143 (1916).

Durio lanceolatus Mast. of Ridley in Fl. Mal. Pen. **1**, 263 (1922) ; *non* Masters in Journ. Linn. Soc. Bot. **14**, 499 (1875) ; *non* Beccari in Malesia, **3**, 250–251 (1889).

Sheets of the type numbers, Ridley 11996 and Ridley 6677, are available at Kew together with 2 unnumbered sheets of Ridley's collected in 1893 which are probably Ridley 3204 ; Ridley 6676 was not seen at Kew.

In Ridley's description the base of the leaf is said to be ' blunt rounded', but on examination of the type sheets at Kew and of the other material available I should describe the base of the leaf as almost cuneate or broadly cuneate, in sharp contrast to that of *D. oblongus* which is definitely broadly rounded. Ridley mentions the flowers as occurring in clusters of 2 or 3 on the trunk ; there is no evidence in the form of notes on the sheets to substantiate this and recent collections in the field in Johore by myself show that the flowers occur in characteristic bracteolate clusters on the main branches behind the leaves.

Bakhuizen van den Brink (*l.c.*, 229) reduced *D. singaporensis* to *D. oblongus* and Corner (*l.c.*, 305) agreed to this. Corner went further and gave a description of what he considered to be *D. oblongus* Mast., but actually he described *D. singaporensis*.

The chief differences between the two species are in the petals. In *D. singaporensis* the outside face of the petal is covered with big scales [outside scaly with fringed scales (Ridley)] and the petal is broadly elongate in shape, whereas in *D. oblongus* the outer face is tomentose and not scaly (stellato-pilosa, cf. Masters) and the petal is rhomboidal in shape, broad at the base and pointed at the tip. Beccari (*l.c.*, 248) described the petals as softly pubescent on both faces (petali mollemente pubescenti sulle 2 faccie) and in his abbreviated latin description as

'utrinque dense pubescentibus'. Another difference is the length of the staminal tube, which is very much shorter in *D. singaporensis* (2-3 cm. long) than in *D. oblongus* (4-5 cm. long). Corner confused the issue when he described the length of the staminal tube as very variable.

Ridley did not describe the fruit of *D. singaporensis* but a note on Sing. 27046 collected by Corner of this species records 'Fruits round, green, splitting open on the tree, seeds dark shiny fawn brown with no aril at all'. This is in sharp contrast with *D. oblongus* which has an incomplete aril enclosing two-thirds of the seed.

Collections—

Johore : Ridley 6677 (1894, Johore, syntype) ; Ridley 11996 (1904, Mt. Austen, syntype) ; Sing. 29257 (Corner) ; Sing. 29350 (Corner) ; Sing. 36974 (Corner) ; Kep. 70316 (Sow and Lindong) ; Kep. 71306 (Wyatt-Smith) ; Kep. 71308 (Wyatt-Smith) ; s.n. (Corner, 6.2.35 ; S. Berassau, nr. Sedili) ; s.n. (Corner, 11.5.35 ; 13½ mile, Mawai-Jemaluang road) ; s.n. (Corner, March 1937 ; S. Kayu, Mawai and Jemaluang Rd.).

Negri Sembilan : Kep. 10342 (Foxworthy) ; Kep. 23695 (Osman).

Pahang : Kep. 10573 (Hamid).

Selangor : Ridley 15595 (small narrow leaved form) ; Sing. 34258 (Corner, a narrow leaved form).

Singapore : s.n. (Mat, 1892 ; Seletar) ; Ridley 3204 (1893, Bukit Timah, syntype) ; Ridley 6676 (1894 ; syntype) ; Sing. 37046 (Corner) ; s.n. (Ridley, 1894 ; Bukit Timah).

Trengganu : Kep. 26993 (Symington) ; Sing. 30148 (Corner) ; s.n. (Corner, 1.11.35 ; Bt. Kahang, Ulu Bendong, Kemaman).

Durio sumatranus Becc. in Malesia, **3**, 249 (1889).

This species was reduced with doubt by Bakhuizen van den Brink (*l.c.*, 229) to *D. oblongus* Mast. At Kew I have seen the duplicate of the holotype, Becc. P.S. 681, and I agree with Bakhuizen van den Brink that there must be some doubt for the leaf of *D. sumatranus* is chartaceous with a cuneate base whereas that of *D. oblongus* is characteristically coriaceous and with a broadly rounded base, but on the other hand leaf characters in *Durio* species do vary considerably.

This species however was described by Beccari on only leaves and fruit and unfortunately he does not mention whether the tree flowers from the branches or the trunk. He stated that the fruit he collected was one that had fallen to the ground and I consider that it is probable therefore that the tree flowers from the branches in the crown of the tree.

The leaf is characteristic in having a long acuminate tip, a membranaceous texture, prominent looped secondary venation and a silvery under-surface, characters which I consider are those of leaves from epicormic branches and which differ from those of leaves from the crown.

The fruit from Beccari's drawing (*l.c.*, plate **23**) I agree appears to be similar to that of *D. oblongus* and *D. singaporensis*.

In view of the locality of the collection, Padang, Sumatra, and the presence of what I take to be *D. singapurensis* Ridl. in Sumatra (Basch, proelation b b 6148 of 10.10.78 collected on the west coast), I consider that it is likely that *D. sumatranus* Becc. and *D. singapurensis* Ridl. are one and the same species. It thus is so *D. sumatranus* Becc. is the older name and will take precedence, but as it is impossible with the inadequate material on which *D. sumatranus* was described to be sure that they are identical I propose retaining for the present the name *D. singapurensis* Ridl. for the common Malay Peninsula species.

***Durio testudinarius* Becc. in Monesim. 3, 244 (Dec. 1899).**

Of the type numbers, a duplicate of Becc. P.B. 2590 is available at Kew but Becc. P.B. 1944 is not present.

Corner *l.c.*, 846 has unfortunately completely misinterpreted this species, which he regarded as very variable and occurring in Malaya in both its typical form and in several varieties. The confusion appears to have arisen largely as a result of a mistake in the colour of the petals and the mistaken belief that there is only one species of *Durio*, namely *D. aculeatum*, with flowers on or at the base of the trunk. He stated erroneously that neither Beccari nor anyone else has described the colour of the flower in this species and added that all the evidence from the Malayan plants pointed to *D. aculeatum* having rose-red petals and pink filaments and style in contrast with the white flowers of *D. alabastrum*. It is true that Beccari makes no mention of the colour of the petals in either his Latin or Italian detailed descriptions but he definitely states *colori* (Petali candidi) in his observation notes (*Osservazioni*).

I do not consider that there is any evidence that this Sarawak species occurs in Malaya, though *D. pinnangensis* Ridl. resembles it in leaf characters and the position of flowers at the base of the trunk, and was originally described by Beccari *l.c.*, 296, as a variety, var. *D. aculeatum* Becc. var. *pinnangensis* Becc. The colour of the petals in this latter species is however pink, and the fruit, which Beccari never saw, has longish thin spines as in *D. muricatum*, whereas that of *D. aculeatum* according to Beccari's drawing *l.c.*, plate 14 has short sharp pyramid-shaped spines or warts. I consider therefore that Ridley was correct in raising it to a species.

***Durio unguis* King**

(see *D. lowianus* Scott, ex King).

***Durio zibethinus* Allen in Syst. Nat. Veg. ed. 13, 351 (1774).**

This is a very common cultivated tree in the Malay Peninsula and Malayan Archipelago. Its origin is not known but I consider that it is probable that it is nothing more than a long established cultivated form of *D. gramineum* Becc. Dr. A. Kostermans writes that *D. zibethum* does not grow in that part of East Borneo which he explored and that in his opinion it is questionable whether it occurs in a wild condition elsewhere.

***Durio zibethinus* Murr. var. *roseiflorus* Corner**

(see *D. lowianus* Scott, ex King).

Key to species of *Diospyros* of the Malay Peninsula

1. Leaves pubescent, underneath or hairy on under surface, very 2
- Leaves glabrous on under surface 3
2. Flowers small, 2-5 cm. across, axillary, solitary, small tree *D. griffithii*
- Flowers larger, 2-5 cm. across, crowded in cymes on branches, large tree *D. oxleyanus*
3. Bractlets phalange distinctly joined into a tube; inner calyx divided or almost divided into 5 parts (such *D. carinatus* which has tubular inner calyx) 4
- Bractlets in free or nearly free phalange; inner calyx united to form a tube with vent at the margin or with slight opening, all species flowering on the branches 9
- Flowers on the branches 5
4. Flowers on the trunk (*D. manniana* also occasionally has flowers as well on the main branches) 7
- Flowers in many-flowered cymes, measuring more than 10 cm. long, inner calyx tubular, petals yellowish, leaves less than 12 cm. long *D. carinatus*
- Flowers in few-flowered cymes or in very short unbranched cymes, less than 10 cm. long, petals white, leaves more than 12 cm. long 6
- Phalange tube greater than 4 cm. long; leaves with large brown, attached golden lenticular scales on under surface *D. macrophyllus*
- Phalange tube less than 4.5 cm. long; leaves with small closely appressed silvery scales on under surface *D. argentea*
- Phalange tube usually less than 4 cm. long; inflorescences without persistent floral bracts 8
- Phalange tube usually more than 4 cm. long; inflorescences with large persistent floral bracts *D. manniana*
- Leaves usually less than 12 cm. long, petals pink; N.W. Malaya *D. pinangianus*
- Leaves usually more than 16 cm. long, petals white, central and wing Malaya *D. manniana*
- Flowers 5 cm. long or pedicels 5 cm. long or longer; inner calyx united for nearly half its length into 5 more or less regular lobes *D. glauca*
- Flowers 4-5 cm. long or pedicels 3 cm. long or less; inner calyx split irregularly and then recloses at base 10

A NEW NAME FOR *LEGENOCARPUS* STOUTEE

ERICASE

[illegible]

Nageiocardus

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific information required.

[illegible]

Frucht. Nuss. Pflanzenkunde. 4. 11. 25. 1882.

N. SETTAIUS

[illegible][illegible]

V. China

[Faint handwritten notes at the bottom of the page]

1. Definition of the problem to be solved.
 2. Formulation of the problem in terms of mathematical models.
 3. Formulation of the problem in terms of mathematical models.

The Geography of Flowering Plants.*—The second edition of this well-known and useful book follows closely the main outlines of the first, though certain chapters have been rewritten and many other sections enlarged. The pages have increased from 403 to 452, and the price from thirty to fifty shillings—yet another instance of the way in which valuable text-books are being placed beyond the reach of the student's pocket through increases in the cost of printing.

The bias of this work is floristic, and thus considerably different from that of that other modern text-book, Cain's *Foundations of Plant Geography*. Professor Good gives a division of the world into floristic units, and then analyses the ways in which families genera and species are distributed through or within these units, discussing among other things wide ranges, endemism and discontinuities. He then passes on to the British flora, considering in particular the distribution of plants in Dorset—a most interesting and valuable chapter. Geological history and past distributions are next dealt with, and the book finishes with a lengthy consideration of the factors influencing the geography of plants, and an account of Professor Good's Theory of Tolerance. A third edition of the very useful list of widely discontinuous genera appears as an appendix.

In a work covering in some detail the distribution of families, genera and species in various parts of the world, mistakes are inevitable. Had these details been scrutinised by more experts on the various geographical areas the mistakes would have been fewer. Thus, among the species given as characteristic of the various regions into which Africa is divided on pages 183–188, *Cola acuminata* is not a species of the Sudanese Park Steppe Region, but rather of the rain-forest, *Khaya senegalensis* is not characteristic of the rain-forest of W. Africa, and *Pterocarpus erinaceus* does not occur in the East African Steppe Region. The floristic analysis of the vegetation of the Cameroon Mountain, quoted on page 187, is utterly untrustworthy and misleading; while from its solitary mention on page 190 it might be assumed that *Brachystegia spiciformis* is characteristic of the east coast of South Africa! On page 86, where temperate genera are classified according to their extension southwards, *Berberis* and *Vicia* are given as examples extending south only in America, but both occur in Africa as natives as far south as southern Tanganyika and Nyasaland. These errors relate merely to one continent of which the reviewer has had some experience.

Turning to the British flora, it should be pointed out that *Orchis traunsteinerioides* (p. 239) is not confined to Ireland, and the figure of three endemic hawkweeds in that country might, if the late Mr. Pugsley's Prodrômus of the British Hieracia had been consulted, be increased to eight.

Such minor criticisms are not intended to detract from the value of the work, whose first edition I have personally found of absorbing interest, but rather to indicate the difficulties and pitfalls that beset a writer accumulating so large a mass of facts from so many different sources, of whose reliability it must be often hard to judge. In spite of this, every student of plant geography would do well to make himself familiar with the contents of this book.

J. P. M. BRENNAN.

* The Geography of the Flowering Plants, by Professor R. Good; second edition. Pp. iv. + 452; 25 plates. Longmans, Green & Co. 50s.

THE RUSTAM HERBARIUM, 'IRAQ.—PART VII.

ECONOMICS*

by E. R. GUEST.

The agricultural products of 'Iraq can be divided into two categories—winter and summer crops. On the northern plains and in the mountains of Kurdistan winter crops are grown entirely on rainfall ("daim" crops); summer crops cultivated during the long, hot, dry spell of weather have to be irrigated from springs or streams. In the central and southern areas of 'Iraq neither winter nor summer crops can be raised without irrigation, though when the rains have been ample it is not necessary to give much additional irrigation to the winter crops. The cultivated areas in this region are confined to a narrow strip of land along each bank of the rivers. The only exceptions are certain regions on the Euphrates and Diyala and on the Tigris near Amara where canal systems have been established which bring irrigation water a considerable distance from the river. Vast stretches of the alluvial plain of Lower 'Iraq could be cultivated if water was brought to them. They now lie as empty desolate wastes. As traces of large canals and village mounds testify, many of these regions were once inhabited cultivated areas. They were abandoned long centuries ago when the native population was destroyed by foreign invaders or sometimes when constant irrigation had rendered the land too salt for further cultivation.

The most extensive crop-growing areas in 'Iraq are in the sub-montane region—the plains of Mosul, Arbil and Kirkuk. Nearly all the land in this district is occupied by a settled population. Winter crops are cultivated universally, but owing to lack or shortage of water the summer crops grown here are of limited extent, depending on the existence of springs, wells, rivers or underground water conduits running down from the foothills ("karezes"). In the south where the cultivated areas are restricted to the neighbourhood of rivers and canals the proportion of summer crops to winter is very much greater. Except in the marshes of the south where large quantities of rice are produced winter crops are still the more important of the two. Unfortunately agricultural statistics for 'Iraq are very scanty and not much reliance can be placed on those that are available. With the exception of American cotton, none of which is consumed in 'Iraq, the export statistics of the Customs Department are of little value. The exportable surplus left after accounting for internal consumption is subject to very wide fluctuation. The area and yield of different crops in 'Iraq is therefore largely a matter of conjecture.

The most important crops occupying the largest area in almost every part of the country are the two winter cereals, barley and wheat. Next in importance come dates, then rice, sorghum, millet, sesame, tobacco, maize and various pulse crops. The staple food of the majority of the inhabitants consists of wheat, barley, dates and rice.

* Dept. of Agric., 'Iraq : Bull. No. 27 "Notes on plants and plant products with their colloquial names in 'Iraq" by Evan Guest—Baghdad, Govt. Press. 1933.

For further information on this subject see the Memoirs, Bulletins and Leaflets of the 'Iraq Department of Agriculture. Bulletin No. 27 contains a brief mention of all the known economic plants of 'Iraq and of their uses.

climate for slow ripening the barley produced in 'Iraq (*Hordeum distichon* and *vulgare*) is of the feeding type rather than the malting ; early-sown barley provides the greater part of the winter grazing in the irrigated areas while horses and other animals are fed on the grain. Oats are not grown at all, the prevalence of wild oats (*Avena ludoviciana*, *A. barbata* and *A. fatua*) as a noxious weed of winter cereals leading to a prejudice against this crop which even the introduction of superior cultivated varieties will not easily overcome. The other cereals grown in 'Iraq are all summer crops. Rice (*Oryza sativa*) is cultivated extensively throughout the southern marshes and to a limited extent in the valleys of Kurdistan and on the flow canals of certain regions of Lower 'Iraq. Sorgho or giant millet (*Sorghum cernuum*) is grown on large areas along the river borders in Lower 'Iraq and sometimes in small fields on the northern plains. The common millet (*Panicum miliaceum*) and Italian or foxtail millet (*Setaria italica*) are also grown as irrigated summer crops, the former especially in the Gharaf district. A local dwarf variety of maize (*Zea mays*) is cultivated, but the larger varieties are hardly ever seen in 'Iraq.

Sesame (*Sesamum indicum*) is the only oil-seed crop of any importance ; it is grown as an irrigated summer crop throughout the country. Recently the Department of Agriculture has made efforts to encourage the cultivation of linseed (*Linum usitatissimum*), a winter crop, but the area under cultivation is at present very small. Rape (*Brassica napus*) is another winter oil-seed crop of which small patches are occasionally seen in the neighbourhood of towns ; it is of no importance and is generally grown for forage rather than for seed. Sunflower (*Helianthus annuus*) and castor oil (*Ricinus communis*) are both grown as garden plants, chiefly for ornament or sometimes as windbreaks along the margin of cotton and other summer crops, but never for seed. Another plant commonly grown round the borders of fields in summer is Deccan hemp (*Hibiscus cannabinus*) ; ropes are made from the fibres of this plant, but the local variety is too short to be of much economic value. American cotton (*Gossypium hirsutum*) was introduced into the country after the British occupation and in 1928 the total production from 'Iraq exceeded 5,000 bales of 400 lb. each. After that year the area under this crop fell off very rapidly owing to the slump in world prices which has discouraged local farmers ; the annual production became almost negligible. [The crop recovered its popularity with the improvement in world prices in later years, and by 1939 79,000 acres were under cotton, and 2,900 tons of ginned cotton were exported in that year. By 1941 the acreage increase to 225,000, but in 1942 the acreage was reduced by 75 % with the loss of the Japanese market. Since the war, owing to the high prices for food crops, cotton has not recovered its relative importance.] The short-staple local cotton (*G. herbaceum*) which has been grown in the country for centuries is still cultivated on a small scale in northern 'Iraq. Tobacco (*Nicotiana tabacum*) is widely cultivated in the Kurdish valleys and to a lesser extent in other localities.

The remaining agricultural products of 'Iraq are all pulse or forage crops. Lentils (*Lens ervum*) are grown in the north and the blue vetchling or chickling vetch (*Lathyrus sativus*) in the south, both as winter crops. Broad beans (*Vicia faba*) are often sown mixed with barley, especially in the neighbourhood of towns ; the young green barley is cut out by hand

as green winter fodder several times before the mixed crop is allowed to grow away and ripen. Lucerne (*Medicago sativa*) is another forage crop ; it is commonly grown in date gardens on the outskirts of the larger towns whence the green fodder can be brought cheaply to the market. Green gram (*Phaseolus mungo*) and cowpea (*Vigna sinensis*) are both cultivated as irrigated summer crops ; cowpeas are also much grown on the mud flats left along the receding rivers in summer and autumn. The chick pea (*Cicer arietinum*) is cultivated as a pulse in the northern areas.

‘Iraq produces many different kinds of vegetable. Winter and spring vegetables grown in all parts of the country include onion (*Allium cepa*), leek (*A. porrum*), garlic (*A. sativum*), lettuce (*Lactuca sativa*), cabbage and cauliflower (*Brassica oleracea*), turnip (*B. campestris* var. *rapa*), radish (*Raphanus sativus*), carrot (*Daucus carota*), beetroot and spinach beet (*Beta vulgaris*) and spinach (*Spinacia oleracea*). Some potatoes are grown in the north. Okra (*Hibiscus esculentus*), tomato (*Lycopersicum esculentum*), brinjal (*Solanum melanogena*), cucumber (*Cucumis sativus*), melon (*C. melo*), water melon (*Citrullus vulgaris*), pumpkins (*Curcubita maxima* and *C. pepo*), red peppers (*Capsicum annuum*) and sweet chillies (*C. grossum*) are grown everywhere during the summer. French beans (*Phaseolus vulgaris*) and peas (*Pisum sativum*) can also be grown as spring vegetables. Cowpeas have already been mentioned. In addition to the above a number of local plants are used by the inhabitants as vegetables or salads ; among these are purslane (*Portulaca oleracea*), the edible thistle (*Gundelia tournefortii*) and a mallow (*Malva nicaeensis*). Mushrooms (*Agaricus* spp.) and truffles (*Terfezia* sp.?) abound in many parts of the country at certain seasons of the year ; they are gathered by the people and sold plentifully in the local markets. There are besides a number of small garden crops used as spices or condiments, such as dill (*Anethum graveolens*), fenugreek (*Trigonella foenum-graecum*), cummin seed (*Cuminum cyminum*), “ Black cummin ” or fitches (*Nigella sativa*), basil (*Ocimum basilicum*), etc. The fruits of the caper (*Capparis spinosa*) which grows wild all over the country are sometimes gathered and pickled as a condiment.

A large variety of fruits are grown in ‘Iraq. Of these the date (*Phoenix dactylifera*)* is by far the most important ; after wheat and barley it is the principal agricultural product of the country. The Basra date-growing area along the banks of the Shatt-al-Arab River is the largest in the world and the average annual export from ‘Iraq exceeds 100,000 tons of this fruit—the bulk of the world’s date crop. Irrigated date gardens are situated round all the principal towns of Lower ‘Iraq, but dates are not grown much north of the Jabal Hamrin except at Kifri, Khanaqin and one or two other places. The date palm has numerous uses ; various parts beside the fruit provide food for man or beast, the trunk is used for timber and fuel, the stones for charcoal for the silversmiths, the fibre for rope and the fronds and leaflets for matting, weaving, etc. Next in importance after dates come the citrus fruits of which many kinds are cultivated, especially in the Baquba region where a suitable soil with free drainage into the Diyala River, watered by an extensive system of flow

* for further information on dates see Memoir No. 3 of the ‘Iraq Department of Agriculture—“ Dates and date cultivation of the ‘Iraq ” by V. H. W. Dowson—(Heffer & Sons, Cambridge. 1921).

SOUTH-EAST 'IRAQ



canals, affords conditions peculiarly suitable for the production of excellent oranges under the shade of date palms. The common orange (*Citrus sinensis*) is most usually grown, but other citrus fruits cultivated in 'Iraq include the Seville orange (*C. aurantium*), the mandarin orange (*C. reticulata*), the citron (*C. medica*), the lemon (*C. limon*), the rough lemon (*C. limon* var.), the lime (*C. aurantifolia*), the sweet lime (*C. aurantifolia* var. *limetta*) and the shaddock or pomelo (*C. grandis*).* Pomegranates (*Punica granatum*), figs (*Ficus carica*) and grapes (*Vitis vinifera*) are cultivated in most parts of the country. In the south where grapes are grown on irrigation the crop ripens early in summer, in the northern hills the fruit continues to get ripe until the beginning of autumn; raisins are pro-

* The Latin names are those used in Bailey, Manual of Cultivated Plants 610 (1949).

duced in these hill regions and also wine in certain localities, chiefly by the Christian population. Orchards of apricots (*Prunus armeniaca*) are frequently planted in Lower Iraq and sometimes contain trees of plums *P. domestica*, greengages *P. domestica* var. *italica*, peaches *P. persica*, nectarines *P. persica* var. *nectarina*, pears (*Pyrus communis*), apples (*P. malus*) and quinces (*Cydonia oblonga*). Most of these fruits are small and inferior in quality, though in Kurdistan where the spring season is longer excellent fruit is produced. The mulberry (*Morus* spp.) is another fruit tree which flourishes better in the northern climate but manages to produce small fruits in the south. Blackberries are occasionally grown in fruit gardens, notably at Daltawa; they are found wild in the valleys of Kurdistan. Almonds (*Amygdalus communis*) and pistachio nuts (*Pistacia terebinth*) are grown in the north and magnificent walnut trees (*Juglans regia*) are common in the Kurdish valleys. Olives (*Olea europaea*) are produced by some of the villages north of Mosul. The date gardens of the Shatt-al-Arab contain a certain number of trees of sebestens (*Cordia myxa*) which produces an inferior kind of fruit eaten by the local inhabitants. The fruit of the "nabaq" (*Zizyphus spina-christi*), a tree found in most of the towns of Lower Iraq is also sold in the local markets and eaten by the people. In many of the valleys of Kurdistan sumach (*Rhus coriaria*) is cultivated; the fruit of this tree is not eaten but is used with the bark and leaves for tanning and dyeing.

With the exception of the mountain areas Iraq is extremely poor in timbers. In Lower Iraq the trunk of the date palm is much used for timber and for fuel. The wood of *Zizyphus spina-christi* is hard and durable; it is suitable for furniture making and other purposes but the number of these trees in the country is very limited. The mulberry provides wood for boats, furniture, agricultural implements, building and fuel. Other cultivated trees such as eucalyptus (*Eucalyptus coolabah* and *E. camaldulensis*), sissoo (*Dalbergia sissoo*), Persian lilac (*Melia azedarach*), etc. are capable of providing useful timber or fuel but are not yet planted in sufficient numbers to be of any economic importance. There are no forests beyond the limits of Kurdistan and almost the only native trees are those which grow in thickets along the river banks, such as willow (*Salix acmophylla*), Euphrates poplar (*Populus euphratica*) and tamarisk (*Tamarix meyeri* and *T. pentandra* subsp. *tigrensis*). Mature trees of Euphrates poplar provide timber for planking and boat building, but the wood of the willow is of little value; the young branches of this tree are used to make baskets. Tamarisk shrubs in the riverside thickets are periodically cut for fuel. The giant tamarisk (*T. aphylla*) is cultivated in small depressions in the desert beyond Zubair, near Basra. In this locality subsoil water is found 30-40 ft. below ground level and is tapped by wells. The trees have to be irrigated during their first year, but once they have been established they can do without further irrigation even though the annual rainfall is extremely scanty. Though small, the timber is of considerable economic value in this region where no other exists.

The natural forests of Kurdistan consists mainly of oak (*Quercus aegilops*, *Q. infectoria* and other spp.*). Small pine forests (*Pinus halepensis* var. *brutia*) are also found in two adjacent localities north of Mosul, Zawita

* See Systematic List, part IV, pp. 456-9.

SOUTH-WEST 'IRAQ



and Atrush ; the timber of this tree is valuable. Though most of the lower mountain slopes in Kurdistan below 5,000-6,000 ft. belong to a natural forest region many of the hillsides have been completely denuded of trees ; in other places the existing trees are small and stunted—the effect of continual cutting by the local inhabitants and of subsequent cropping by goats. Apart from existing forests in hitherto inaccessible areas the potentialities of Kurdistan as a timber producing region are often shown by isolated trees on ancient graveyard sites where they have been protected from cutting and have grown to a considerable size. Other common trees in the Kurdish oak and pine forests are *Acer cinerascens*, *Pistacia mutica* and *P. khinjuk*, the fruit and leaves of which are much used for tanning, dyeing and soap making. *Crataegus azarolus*, *C. heterophylla*, *P. syriaca*, *Juniperus oxycedrus* etc. Some of these are too small to be of much economic importance. A number of useful trees commonly

grow along streams in the mountain valleys ; they include plane (*Platanus orientalis*), ash (*Fraxinus* spp.) elm (*Ulmus* sp.) and willow (*Salix aegyptiaca*). Magnificent walnuts and mulberries are found by streams near villages in the mountains. The timber of the walnut is especially valuable—it can be used for making furniture, gunstocks and other articles. Poplar (*Populus alba* and *P. nigra*) is also planted near most of the Kurdish villages to provide poles for building and other purposes.

In addition to the trees, crops and garden products of 'Iraq there are a number of miscellaneous products of the soil, some of which are of considerable economic importance. Foremost amongst these comes liquorice (*Glycyrrhiza glabra*), a common plant throughout the country. The underground rootstock of this plant is dug up and sold by the people, especially in bad seasons when the crops are poor.; there is a considerable export trade in liquorice from 'Iraq. Reeds (*Phragmites communis*) and bulrushes (*Typha angustata*) are of great importance in the economy of the marsh Arabs. The young shoots are used for grazing and fodder and the mature plants for building huts, making mats and a variety of other purposes. Rushes (*Juncus maritimus* and *J. acutus*) are also used to make chair bottoms or to weave baskets. Various halophytic Chenopodiaceae (*Haloxylon*, etc.) are used by the people for making alkali as a source of crude soap ; the fruit of the terebinth is also used for this purpose in Kurdistan. Numerous wild plants are employed by the local inhabitants as a source of drugs and dyes ; though the efficacy of some of these drug-plants is doubtful, others could undoubtedly be exploited to obtain modern medicinal products.

Natural grazing is extremely scanty at many seasons of the year in all parts of the country. In the southern regions the ground is only covered for a month or two in the spring by a sparse herbage of annual plants. When this dies down nothing is left except dwarf xerophytic shrubs ; some of these are succulent and afford camel grazing during the summer. The parched spring herbage can also be grazed, during the early summer but vast regions are by then inaccessible owing to lack of water. On the northern plains and foothills the spring herbage is more luxuriant and of longer duration. In the higher mountain regions the natural pastures begin to come on after the snow has melted away. Most of the pastoral community is continually migrating from one locality to another in search of fresh grazing grounds and the shepherds take their flocks up to higher pastures as the summer advances. They begin to move down again when the coming of winter is heralded by fresh falls of snow on the higher peaks. The winter in these mountain regions is severe and dried fodder is preserved in the villages to tide over the period when no fresh vegetation is available. In Lower 'Iraq young green barley affords a certain amount of winter grazing, but in bad seasons when the rains are late or insufficient large numbers of animals die of starvation.

The remaining natural resources of 'Iraq need not be considered here. They include oil, bitumen and various other minerals, such as salt, lime, gypsum, etc. The products of the oilfields and the products of agriculture constitute the chief wealth of the country.

THE INTERPRETATION OF DIANTHUS VISCIDUS BORY ET CHAUBARD.

PATRICIA RAWDON.

In "Nouvelle Flore du Péloponnèse et des Cyclades, 26 (1838)", Bory and Chaubard published the following description of *Dianthus viscidus* :—

"Floribus aggregatis squamis exterioribus ovato-rotundatis mucronatis calycem brevem subaequantibus : Foliis cauleque viscido-pilosis : Petalis crenatis barbatis. Perennis.

Fl. pâles, avec des stries d'un pourpre intense à la gorge, E. En montant au Taygète parmi les rocailles.

DESCR. *Radix* perennis. *Caules* caespitosi erectiusculi piloso-viscidi subspithamei. *Folia* trinervia basi quinquenervia viscida pilosa acuta. *Flores* 3-4 aggregati. *Squamae* nudae asperiusculae exteriores ovatae mucronatae, interiores rotundatae in mucronem longam trinerviam productae calycis tubum brevem subaequant. *Calycini dentes* acutissimi. *Petalorum* limbus crenatus dentatus intus pilosus subtus discolor."

The height of the plant (less than a span) and the number of flowers (3-4) are the significant characters.

In "Flora Orientalis I, 509 (1867)", Boissier cites the following specimens under *D. viscidus* Bory et Chaubard :—

"Montes Ætoliae (De Heldreich Herbarium Graecum normale No. 637) ; Parnassus (De Heldreich Herbarium Graecum normale No. 37, sub *D. parnassico*) ; Taygetus (Heldreich) ; Malevo Laconiae (Orphanides) ; Mons Delphi Eubeae (Aucher Herbarium Orientale Collectio Ime 1837, No. 499)."

All these plants are distinctly more than a span in height, and comparison with Bory's original specimen from Taygetus suggests that they are not *D. viscidus* Bory et Chaubard but a variety of this species. Boissier's plants correspond very well with the type of *D. viscidus* Bory et Chaubard var. *elatior* Halácsy, which is described in "Halácsy : Conspectus Florae Graecae, 208 (1901)" as follows :—

"1-pluricaulis, caules stricti, elati, usque 60 cm. alti, flores 1-5 fasciculato-capitati ; squamae inflatae ut et calyces dense glanduloso-pubescentes, in aristas calyce breviores abeuntes, calyces subventricosi, 20-25 mm. longi, virescentes. Forsan species propria.—Exsicc. : Hal. It. Gr. sec. a. 1893."

In Boissier's "Diagnoses Plantarum Orientalium Novarum, ser. I, No. 8, 64 (1849)", *Dianthus viscidus* Bory et Chaubard var. *tymphrestea* Boissier et Spruner is described :—

"Caules tantum 2-3 pollicares, petala facie superiore glabra nec papillosa suprâ basin limbi maculâ transversâ intense purpureâ picta.

Hab. in monte Velugo (Tymphresto) Ætoliae (Spruner)."

This specimen has been examined and is found to resemble Bory's original specimen of *Dianthus viscidus* so closely that the two may be regarded as the same species.

Later, in Boissier's "Diagnoses Plantarum Orientalium Novarum, ser. II, No. 6, 27 (1859)", Heldreich and Sartori raised *D. viscidus* Bory et

Chaubard var. *tymphrestea* Boissier et Spruner to the rank of species under the name *D. tymphresteus* (Boissier et Spruner) Heldreich et Sartori. The type of this new species was the Spruner specimen previously cited by Boissier and Spruner. *D. viscidus* Bory et Chaubard var. *tymphrestea* Boissier et Spruner [later known as *D. tymphresteus* (Boissier et Spruner) Heldreich et Sartori] and *D. viscidus* Bory et Chaubard are therefore synonymous. It would appear that the former was described by Boissier and Spruner solely on account of a misinterpretation of Bory et Chaubard's *D. viscidus*. Accordingly it is proposed that *D. viscidus* Bory et Chaubard var. *tymphrestea* Boissier et Spruner and the species *D. tymphresteus* Heldreich et Sartori be discarded and the plants so named placed under *Dianthus viscidus* Bory et Chaubard.

D. viscidus Boissier (non Bory et Chaubard) may be distinguished as *Dianthus viscidus* Bory et Chaubard var. *elatio*r Halácsy.

Rice.*—This extremely important and widely cultivated cereal is the staple food of more than half the World's population and especially of the millions crowded into south-east Asia. It may surprise some to know that although its literature comprises thousands of articles scattered through scientific and agricultural publications, very few attempts have been made to gather together the essential information in handbook form. The standard work on rice in English by E. B. Copeland was published nearly thirty years ago and is now very difficult to obtain. The present account has appeared at a most opportune time, since international and other organizations are urging among other matters the great necessity for considerable improvements in the quality and yield of rice.

The bulk of this book is of an agricultural nature, dealing with all aspects of the cultivation of rice, its diseases and pests, milling, nutritive value, production, yields and consumption. This is the portion which, being based on the author's long experience with rice in Malaya and elsewhere, is naturally of greatest value to all connected with rice-culture. The remainder of the work is devoted to chapters on the origin and history of rice, its botanical and agricultural characteristics and to the classification of its exceedingly numerous varieties. These will appeal to those botanically minded, but they will find the account of species of *Oryza* and the origin of rice incomplete and at times inaccurate, whilst the section on the rice spikelet does not take into consideration recent studies of this organ and moreover is so worded to suggest that the author is uncertain as to its exact structure. These are, however, minor matters in a practical work intended primarily for agriculturists.

This volume is the first of a "series of books on tropical agriculture being published with the active encouragement of the Colonial Advisory Council of Agriculture, Animal Health and Forestry, under the editorship of Sir Harold Tempny, C.M.G., C.B.E."

* Rice, by D. H. Grist, pp. 331 + x, with 68 photographs and 34 text-figures, 1953. Longmans, Green & Co., London, New York and Toronto, price 35/-.

A NEW MALAYAN ATHYRIUM

By R. E. HOLTUM.

Athyrium curtisii *Holtum*, sp. nov., *A. bantamensi* (Bl.) Milde affinis, differt : lamina tenue ; pinnis oblongis-acuminatis, falcatis, maximis 4 cm. latis, margine crenatis vel lobatis, basi abrupte angustatis ; pinnis infimis petiolulatis, basi valde inaequalibus ; lamina apicale basin versus profunde lobata.

Stock short, suberect ; *scales* to c. 7 mm. long and 1 mm. wide, dark brown, edges finely toothed. *Young plants* with simple leaves to 9 by 3.5 cm., base cordate, edges toothed throughout and rather broadly so towards apex, veins all free ; later fronds with one or more pairs of pinnae, the apical lamina not cordate. *Fronds of mature plants* with stipes c. 50 cm. long, lamina c. 50 cm., rachis proliferous near base of an upper pinna, pinnae c. 8 pairs, apical lamina narrowly deltoid with deeply lobed base, texture thin ; *lowest pinnae* stalked, stalks to 5 mm. long, base very unequal, the basiscopic half rounded and meeting the costa at a point further from the rachis than the base of the acroscopic half, the acroscopic half subtruncate ; *upper pinnae* sessile, basiscopic base rounded, acroscopic base broadly cuneate and wider ; *general shape of pinnae* oblong-acuminate, falcate, the base abruptly contracted, the edges broadly crenate or lobed to a depth of 3-4 mm. in the basal part and crenate towards apex ; *largest pinnae* 15-20 cm. long and 4 cm. wide ; *veins* all free, in small groups corresponding to the crenations or lobes of the margin, the first acroscopic lateral vein of each group running to the margin and sometimes bearing a diplazioid sorus on more than $\frac{3}{4}$ of its length, the other sori all much shorter and in the outer $\frac{1}{4}$ of each half of the lamina ; *rachis* and costae minutely hairy in the groove of the upper surface, otherwise glabrous.

TYPE : Sungei Buloh, Selangor, Malay Peninsula, alt. 300-500 ft., leg. *B. E. G. Molesworth-Allen*, no. 2338, 1953.

Other specimens : at type locality, *B. E. G. Molesworth-Allen* no. 2334 ; Waterloo, Perak, *C. Curtis* no. 1362, Dec. 1887 (Herb. Singapore).

In the Malay Peninsula the species *Athyrium bantamense* (or what I have so identified) is widely distributed. It occurs especially on rocky stream-banks, and has simple elliptical subentire pinnae which are decidedly fleshy when living, thinly leathery when dried. *Athyrium curtisii* agrees with *A. bantamense* in scales, free veins and arrangement of sori, but differs in the shape and texture of the pinnae. The species is well characterized by the good new material collected by Mrs. Allen. This material includes young plants, the form of which is often distinctive.

A Flora of Buenos Aires.*—It is a pleasure to see this book, which is the first of its kind to be published in Argentina. The area covered by it has no hard-and-fast limits: the *alrededores* ("environs") of Buenos Aires, by the author's definition, include not only the immediate neighbourhood of the Federal Capital, but also a strip of country about 30 miles wide bordering the Rio Paraná for at least 100 miles to the north-west and the shore of the River Plate for a somewhat shorter distance to the south-east of the city. Once again, as with Fernald's great Manual, we look in vain for a map to show us what is meant, but at least let us realize that in this small area is concentrated about one half of the entire population of Argentina together with most of its cultural institutions.

The author gives a brief sketch of the main plant communities. As we should expect, the vegetation climax is the Grass-Steppe of the *pampa*, but the vicinity of the great rivers has a moderating influence on the climate which allows the development of woods. Streams, lakes and *barrancas* lend variety to this level scene. Naturally, the communities have been greatly affected and altered by the influence of man; the original vegetation persists only in relict areas near railways or in certain uncultivated *campos*; while the large number of weeds introduced from Europe is an important element of the flora which will interest British botanists. Dr. Cabrera is dealing with "wild" and naturalized plants, and he does not include species commonly cultivated in gardens. His statistical summary at the end of the book gives 1387 species of vascular plants in 130 families, the largest of which are the *Compositae* (235 species) and *Gramineae* (234). The absence of any large genera in this area is a fact which is hardly surprising when one considers its size, the relative uniformity of the warm-temperate climate and vegetation, and the disastrous activities of a huge population of humans: only 15 genera have more than 9 species, and the three largest are *Cyperus* (25), *Solanum* (24) and *Baccharis* (21).

The plan of the flora admirably follows the lines of the best modern manuals. The specific keys are elaborate and obviously designed with special care (cf. Fernald), the descriptions of species being correspondingly short or even absent. There is a large number of line drawings with useful analyses, and the picture of fruits of genera of *Cruciferae*, drawn to a really generous scale, may be recommended to British botanists, but when will someone give us an equally helpful drawing of "incumbent" and "accumbent" cotyledons? One very good feature of this flora is the constant reference, both under families and genera, to the latest taxonomic revisions and monographs. There are some misprints of Latin names, and Dr. Cabrera has not let himself sink deep into the wallowing-pit of the nomenclature of European plants. He is to be congratulated on the completion of such an excellent, attractive and useful flora.

N. Y. SANDWITH.

* *Manual de la Flora de los Alrededores de Buenos Aires.* By Angel L. Cabrera. Pp. 590. 191 line drawings in text. Buenos Aires: Editorial Acme S.A. (En formación). Price \$140.—m/arg.

NOTES ON ASIATIC GRASSES: XIV.

The genus *Duthiea* Hack.

N. L. BOR.

The genus *Duthiea* Hack. was established by Hackel in *Verhandlungen der Botanischen Gesellschaft, Wien*, **45**, 200 (1895), and dedicated to the collector of the specimen, J. F. Duthie, the well known botanist, sometime Director of the Saharanpur Botanical Garden, and afterwards at Dehra Dun. The grass was named *Duthiea bromoides* Hack.

The specific epithet was well chosen, for at first sight the grass has the facies of a *Bromus*, and, indeed, Hackel was quite certain that the *Festuceae* was the tribe to which the specimen must be referred.

It was not long before a second species of the same genus was found in *Avena oligostachys* Munro, a grass which had been collected by Aitchison in the Kurrum Valley of Afghanistan in 1879. Stapf recognised in 1896 [*Hook. Ic. Pl. sub tab.* 2474] that the generic structure of *Avena oligostachya* was in no way different from that of *Duthiea bromoides*, and he proceeded to make the combination in *Duthiea*. He further remarked "The resemblance of the latter (*D. oligostachya*) to certain species of *Danthonia* is so great that it would have to be referred to that genus were it not for the absence of lodicules and the structure of the gynoeceum. This is certainly quite singular in *Aveneae*; still, I think *Duthiea* must be placed in this tribe rather than in *Festuceae* where Hackel placed it".

The third species, *D. nepalensis*, which is described in this paper, was collected a few years ago in Central Nepal, during the visit of a British Museum (Natural History) Expedition. I am grateful to Dr. G. Taylor, Head of the Department of Botany in that Institution, for making the specimen available for study. The general structure of this new species agrees with that of the other two species, but it is so distinct in specific characters that I have no hesitation in founding a new species on a single collection.

Characteristics of the Genus.

Noteworthy features in the genus are the following :—

1. The obovoid ovary lobed at the tip, densely hirsute all over, except on the hilum and the embryo.
2. The cylindrical caryopsis covered with forwardly directed bristles. The hilum is linear and about three-quarters the length of the grain, and is found in a shallow groove on the adaxial side.
3. The single tomentose style, which is longer or shorter than the two stigmas.
4. The stigmas which are thrust out together with the anthers from the tip of the spikelet.
5. The peculiar hyaline bract-like structures which are found almost invariably at the lowest joint of the inflorescence, and also sometimes at the upper nodes of the axis also. As Stapf noted, these are exactly like the ligules, and he assumed that they were homologous with them.

6. The long ligules.

The ovary and style in this genus are quite remarkable and are matched in no genus now included in the *Danthonieae* or *Aveneae*. The absence of lodicules, too, is an element quite foreign to these two tribes. The ligules approximate to those in *Aveneae* and are quite different from the row of hairs characteristic of species of *Danthonia*. In other particulars, e.g., the hairy ovary, the glumes equal to the lemmas in length, the hyaline margins of glumes and lemmas, the lemmas rounded on the back, the perfect awns, all suggest that the genus can be fitted into *Aveneae* if the limits of the tribe be widened to include genera with a single style and no lodicules.

GENERIC DESCRIPTION.

Duthiea Hack.

Spikelets large, laterally compressed, pedicelled in congested one-sided racemes ; rhachilla disarticulating above the glumes and between the florets, prolonged beyond the last fertile floret and crowned with a rudimentary floret ; joints of the rhachilla bearded and hairy to subglabrous ; florets 1—3, hermaphrodite. *Glumes* equal to subequal, elliptic or lanceolate with a moderately wide to very wide, hyaline, shining margin, keeled, 5—7-nerved with nerves anastomosing, persistent. *Lemmas* rounded on the backs, firmly membranous, hirsute or villous on the back, or with the hairs grouped in a line at the base of the awn, cleft to the middle into two obtuse or acute lobes ; *awn* stout, issuing from between the lobes, with a slightly twisted column and a bristle which is antrorsely scabrid ; *palea* 2-keeled about the nerves, which are produced as two setae or not, puberulous or scabrid on the keels, hyaline, with two broad flaps outside the keels, which are glabrous or villous ; *stamens* 3 ; *anthers* large, linear ; *ovary* obovoid, hirsute ; *style* 1, longer or shorter than the two stigmatic arms ; *stigmas* issuing from the apex of the floret ; *caryopsis* cylindric, flattened or grooved on one side, covered with forwardly directed bristles ; *hilum* linear, almost as long as the grain ; *embryo* small, basal ; *lodicules* absent.

Caespitose perennials ; *leaf-blades* linear, folded or rolled, deeply grooved and scabrid on the upper surface ; *ligules* very long, hyaline.

A genus of, so far, three species all confined to the mountainous region of the central and western Himalaya.

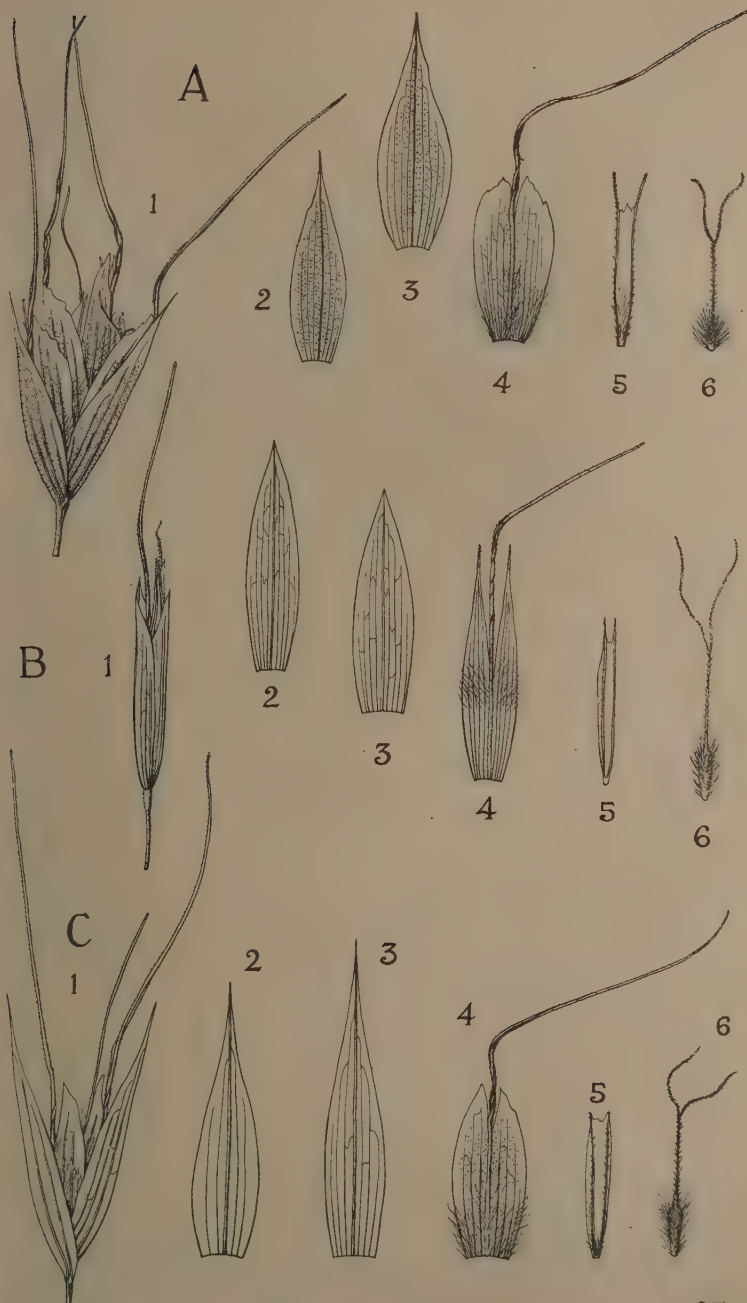
Key to the species of *Duthiea*.

Inflorescence an erect, cylindrical raceme, about 7 cm. long, 8–11-spiculate, hardly exerted from the uppermost sheath ; spikelets cylindrical, 1-flowered ; lemma cleft into two narrow acute lobes, villous in the middle third 1. *D. nepalensis*

Inflorescence not cylindrical, nodding, 3–9-spiculate, well exerted from the uppermost sheath ; spikelets cylindrical or turgid, cuneate, 2–3-flowered ; lemmas rounded, somewhat apiculate at the apex, hairy in lower half :—

Culms scabrid below the inflorescence ; glumes dull, minutely scabrid ; lemma villous in the lower quarter ; palea 2-aristulate

2. *D. bromoides*



O.T.

A. *Duthiea bromoides* Hack. B. *D. nepalensis* Bor. C. *D. oligostachya* (Munro) Stapf.
 1, spikelet ; 2, lower glume ; 3, upper glume ; 4, lemma ; 5, palea ; 6, ovary, style and stigmas. All $\times 2$.

Culms glabrous ; glumes very smooth, shining ; lemma covered with long, white appressed bristles in lower half ; palea not aristulate

3. *D. oligostachya*

1. ***Duthiea nepalensis*** Bor, sp. nov. ab aliis duobus speciebus racemotere erecto haud nutante, 8-11-spiculato, spiculis 1-floribus, lobis lemmatis angustis longis acutis differt.

Gramen perenne. Culmi erecti, basi vaginis vetustis tecti. *Foliorum laminae* lineares, in apicem validum longi-attenuatae ; *vaginae* basales breves scariosae, eae culmorum paulo inflatae, complectentes ; *ligulae* longae, hyalinae, conspicuae.

Racemus teres, 7 cm. longus, 8-11-spiculatus ; axis angulatus, striatus, omnibus nodis vel saltem inferioribus bracteis hyalinis instructus ; pedicelli striati. *Spiculae* teretes, 15-18 mm. longae, 1-flores. *Glumae* aequilongae, inferior 6-nervis, superior 8-9-nervis. *Lemma* 15-16 mm. longum, elliptico-oblongum, apice in duos lobos acutos fissum, aristatum, 9-nerve, parte inferiore sparse pilosa, dorso rotundato, basi loborum barbatus ; *arista* 22 mm. longa ; *columna* 10 mm. longa, paulo torta ; *palea* 12 mm. long, bicarinata, brevissime biaristata ; *stamina* 3 ; *antherae* 6 mm. longae ; *stylus* 1 ; *stigmata* 2 ; *ovarium* subovoideum, densissime hirsutum ; *lodicae* nullae.

Duthiea nepalensis Bor, sp. nov.

A perennial grass. Culms erect covered at the base with short, old scarious sheaths, somewhat stout, 2-3-noded, terete, markedly striate, glabrous, more or less scabrid, almost covered with the closely fitting sheaths, glabrous at the nodes, simple. *Leaf-blades* on the innovation shoots up to 16 cm. long, linear, involute-setaceous, ending in a stout subulate point, 2.5-3 mm. wide, deeply grooved on the upper surface, minutely but densely scabrid on the upper surface, coarsely scabrid on the margins, sparsely scabrid on the lower surface, glabrous, those on the culms shorter, up to 3 cm. long, linear-lanceolate in shape, rounded at the base to the sheath, very scabrid on the upper surface ; *sheaths* at the base short, scarious, polished, straw-coloured, breaking up, those on the culms clasping, rounded, slightly inflated, smooth and glabrous below, becoming more and more scabrid as the insertion of the leaf is approached, somewhat glaucous ; *ligule* hyaline, slightly milky, 5 mm. long.

Inflorescence a cylindrical raceme, 7 cm. long, 0.7 cm. wide, erect, hardly exerted from the topmost leaf-sheath, 8-11-spiculate ; axis angled, tough, very scabrid ; pedicels striate, hardly wider above than below, very scabrid, the lowest 4 mm. long, the upper gradually shorter towards the tip, the lowest often subtended by a linear, hyaline scale up to 6 mm. long. *Spikelets* cylindrical, 15-18 mm. long without the awns, 1-flowered. *Lower glume* length of the spikelet, 3 mm. broad, lanceolate-acuminate in shape, minutely scabrid on the dorsal surface, 9-nerved, with the nerves anastomosing, hyaline on the margins ; *upper glume* same shape as the lower, 8-9-nerved. *Lowest lemma* 15-16 mm. long, elliptic-oblong in shape, 4 mm. broad, cleft at the tip into 2 acute lobes, awned in the sinus, 9-nerved with a few hairs at the base, more or less sparsely hairy below the insertion of the awn, but with a row of hairs

at the level of the insertion of the awn, scabrid on the dorsal surface of the acute lobes ; *awn* 22 mm. long, consisting of a stout, twisted column 10 mm. long, the remainder antrorsely scabrid bristle ; *palea* 12 mm. long, 2-nerved, 2-keeled with the keels close together and the nerves produced as short awns, with wide hyaline marginal flaps ; *stamens* 3 ; *anthers* linear, 6 mm. long ; *style* one, hairy ; *stigmas* 2 ; long ; *ovary* subovoid, densely hirsute ; *caryopsis* not seen ; *lodicules* absent.

IND. OR. : Nepal, Langsisa Kharka, 15 Jun. 1949, 4,500 m., *O. Polunin* 404—grassy slopes (typus in Herb. B.M.).

This very distinct species was collected during the British Museum Expedition to Central Nepal. The field notes state it was collected on grassy slopes which seems to indicate that it prefers a milieu quite different from the rocky arid habitats frequented by the other two species.

2. **Duthica bromoides** Hack. in Verhandl. Bot. Ges. Wien, 45, 200 (1895).

A perennial grass with many thick fibrous roots. *Culms* erect from a very shortly decumbent base up to 80 cm. tall, slender, simple, striate, 2-3-noded, glabrous, very scabrid below the inflorescence, glabrous on the nodes. *Leaf-blades* on the culm sheaths short, up to 4 cm. long, 10 mm. broad, involute on both margins, lanceolate in shape, glabrous on both surfaces, very scabrid on the upper surface, scaberulous on the lower surface below, becoming scabrid towards the apex, those of the innovation shoots up to 35 cm. long, 2.5-3 mm. broad, linear, tapering to a stout point, often narrow, involute, twisted or flat, glabrous on both surfaces, very scabrid on the upper surface, smooth below, except towards the tip, scabrid on the margins, green or somewhat glaucous ; *sheaths* very loose below, scarious, shining, slipping from the culms and often breaking up into fibres, those on the culms tighter, striate, scabrid ; *ligules* 6 mm. long, elongate, lacerate on the margin.

Inflorescence a congested raceme, 2.5-4 cm. long, of rather turgid spikelets at the tip of a scabrid peduncle ; racemes 2-9-spiculate ; axis flexuous, angled, scabrid to very scabrid ; pedicels 2.5 mm. long, similar to the axis. *Spikelets* cuneate or ovate-oblong in shape, 10-22 mm. long, 4-5-flowered. *Lower glume* rounded on the back, about 16 mm. long, about 4 mm. broad, mucronate, almost aristulate, oblong-oblancoelate in shape, 5-6-nerved, often somewhat oblique, 2 nerves one side of the mid-nerve and 3 outside, rounded above with sinuate, often bluntly toothed margin, scaberulous all over, glabrous, dull, with the nerves more or less anastomosing ; *upper glume* rounded on the back, 16 mm. long, 5-6 mm. broad, elliptic-oblancoelate, 7-10-nerved, with nerves anastomosing, scaberulous all over, narrowly attenuate at the tip about the prolongation of the mid-nerve, hyaline on the margins. *Lowest lemma* 14 mm. long, 5.5-6 mm. wide, elliptic in shape, with a few blunt teeth on each side of the apical fissure, 10-11-nerved, with the central nerve very strong and carried out as a stout awn, all nerves anastomosing with one another, but not at the tip, hyaline on the margins, scabrid all over the back and villous in the lower quarter with whitish hairs ; *awn* 15-25 mm. long, including a column 7-12 mm. long, very scabrid, chestnut-brown ; *palea* about 12 mm. long, with two strong parallel nerves projecting as

two horns, hyaline between the horns and with hyaline flaps outside, 2-keeled, scabrid and shortly pilose and scabrid on the keels; *stamens* 3: *anthers* 7 mm. long, linear; *filaments* flat; ovary obovoid, densely hirsute; *style* 1, straight, densely hairy; *stigmas* 2, papillose; joints of the rhachilla cuneate, densely bearded; *caryopsis* 6.7-5 mm. long, cylindrical, lobed at the top, densely covered with antrorse, golden bristles 1-2 mm. long, with a shallow concave groove on one side at the bottom of which is the linear hilum, about three-quarters the length of the grain or more; *embryo* one-quarter to one-eighth the length of the grain; tip of the rhachilla crowned with a rudimentary floret; *lodicules* absent.

IND. OR.: Kashmir: Lidda Valley above Kainmull, 21 Jul. 1893, J. F. Duthie 13155; ibidem, Sonsal nallah, 4000 m., 31 Jul. 1893, J. F. Duthie 13382; Apharwat, above Killanmarg, 4000 m., 25 Aug. 1926, R. R. Stewart 8847.

Kagan: Giti Dass, 23 Nov. 1899, *Inayat*.

Hazara: Siran Valley, 4000 m., 26 Jun. 1896, *Inayat* 20316.

Bashahr: Brenda Pass, 9 Aug. 1895, comm. J. R. Drummond.

3. ***Duthiea oligostachya*** (Munro) Stapf in Hook. Ic. Pl. 25, sub tab. 2474 (1896).

Avena oligostachya Munro in Jour. Linn. Soc. Bot. **19**, 193 (1881) t. 30.

A perennial caespitose grass. Culms erect from a slightly curved base covered with remains of old sheaths which gradually break up into fibres, very slender, smooth and glabrous, simple, up to 30 cm. tall, 2-3-noded, shortly exserted from the uppermost sheaths. Leaf-blades setaceous-convolute, ending in a subulate sharp point, curved, up to 12 cm. long, 2 mm. broad when flattened, scaberulous on the lower surface, deeply grooved on the upper surface and densely covered with short, thick hairs, very scabrid, scabrid on the margins, rather thick; sheaths on the culms very tight and carrying reduced blades, very striate, apparently smooth and glabrous, those on the lowest nodes much longer, very loose and slipping away, striate, finally disintegrating into fibres; ligule very long, hyaline, shining, lacerate above, 10-12 mm. long.

Inflorescence a simple raceme at the tip of the shortly exserted peduncle; racemes congested, 3-4-spiculate, 3-4 cm. long, 1-1.5 cm. broad, shining; axis smooth and glabrous, with, at the insertion of the pedicel (at least at the lowest), a linear hyaline structure up to 12 mm. long, occasionally to be found also at the other pedicel insertions, often reduced to a mere hyaline hair; pedicels clavate, 2.5-3 mm. long, glabrous and smooth, or with a few scabridities towards the top. Spikelets 16-18 mm. long without the awns, 2-flowered, lanceolate, or when opened, wedge-shaped. Lower glume 17-18 mm. long, 5 mm. wide, elliptic-acuminate in shape, rounded on the back, very broadly hyaline and glistening on the margins, 5-nerved, smooth and glabrous on the dorsal surface; upper glume a little longer than the lower, similar in texture and shape, 6-nerved. Lowest lemma 14-15 mm. long, 5 mm. broad, elliptic in shape, rounded on the back, cleft to the middle into two acute lobes, smooth on the dorsal surface, but covered in the lower half with dense long white hairs 3 mm. long, 7-nerved, upper half smooth and glabrous; awn 35 mm. long, of

which 15 mm. is stout, twisted column, the remainder an antrorsely scabrid bristle ; *palea* 10–10·5 mm. long, linear, 2-nerved and 2-keeled, hyaline between the keels and with two broad, hyaline flaps, villous with white hairs, which embrace the flower, slightly scabrid on the keels which are not drawn out at the apex into horns ; *stamens* 3 ? ; *anthers* not seen ; ovary ovoid, lobed at the apex, very hirsute ; *style* one, softly hairy ; *stigmas* 2, long, plumose, papillose ; *caryopsis* (immature) 4–5 mm. long, covered with antrorsely arranged stiff bristles, grooved on one side at the bottom of which is the linear *hilum* ; *joints* of the rhachilla clavate, very densely bearded with white hairs just below the lemma, crowned with a rudimentary floret which consists of a rudimentary lemma and awn ; *lodicules* absent.

AFGHANISTAN : Kurrum Valley, Shend Toi, 25 May 1879, *Aitchison* 367—the coarse grass hanging from the rocks in the gorge (typus in Herb. Kew.) ; Lakhman Khel, Tangi, 8 May 1894, *Harsukh* 14971.

The type-species of *Cyanella* [Royen] Linn. (Tecophilaeaceae).

A. A. BULLOCK.

The valid publication of the generic name *Cyanella* was in Linn. Gen. Pl. ed. 5, 149 (1754), but the earliest specific epithet attached to it has been attributed to Linn. Sp. Pl. ed. 2, 443 (1762) or to Linn. Syst. Nat. ed. 10, 2, 985 (1759). In both of these places *Cyanella capensis* was the only species cited and it is not surprising, therefore, that Phillips (Genera of South African Flowering Plants, ed. 2, 207 : 1951) quoted it as the type species.

It has now been pointed out by Mr. Bakhuizen van den Brink, Jr., through Dr. van Steenis (*in litt.* 1953) that the name *Cyanella hyacinthoides* occurs in a short *addendum* following the last (unnumbered) page of the index to Linn. Gen. Pl. ed. 5 (1754). This publication is undoubtedly valid, although the epithet is not accompanied by a description, since the genus was at that time monotypic and the generic description may be accepted as a generico-specific description in the sense of Art. 50 of the International Code of Botanical Nomenclature.

The type of *Cyanella capensis* Linn. is clearly the Royen specimen in Linné's herbarium ; also Linné attributed the original description to Royen. This must be the type also of *Cyanella hyacinthoides* Linn. and the name *Cyanella capensis* is therefore illegitimate, having been superfluous at the time of its publication.

The synonymy of the species is as follows :—

Cyanella hyacinthoides Linn. Gen. Pl. ed. 5, addendum, pag. ult., post ind., typus nominis generici.

C. capensis Linn. Syst. Nat. ed. 10, 2, 985 (1759) et Sp. Pl. ed. 2, 443 (1762) ; Baker in Thiselton-Dyer, Fl. cap. 6, 7 (1896).

Vegetable Tanning Materials.*—This book, written by a member of the Kew staff, deals with those plants known to be rich in tannin or to be used in the tanning of leather in any part of the world. About 800 species are dealt with or referred to. The subject matter is arranged in sections viz.—‘barks’, ‘woods’, ‘fruits’, ‘leaves’, ‘roots’, and ‘miscellaneous’. In the introduction such subjects as the nature of tannin, its occurrence and function in the plant and factors affecting its production are discussed, also the early and present day uses of tanning materials, tanning extracts and world trade in tanning materials.

Separate chapters are devoted to each of the commercially important tannin plants such as black wattle, quebracho, chestnut, oak, myrabolans, valonea, sumac and mangroves, etc. Those of less importance are dealt with more briefly. Special prominence is given to the black wattle and to mangroves as it is felt these barks may claim increased attention in the future to make up for diminishing supplies of certain other tanning materials such as chestnut from Europe and North America and quebracho from South America.

With the increasing world population and the greater use of boots and shoes in many countries, especially in Asia and Africa, the consumption of vegetable tanning materials continues to increase. In spite of the extensive use now made of mineral tannage (notably chrome tanning) and to a less extent of synthetics or “syntans” vegetable tannins are still in keen demand and essential for ‘heavy’ leathers such as sole leather. It is appropriate therefore that a general and up-to-date survey of the world’s tannin yielding plants should appear at the present time.

Guatemalan Orchids.†—In a notice of the first part of Dr. Correll’s book “Orchids of Guatemala”, on page 238 of last year’s volume of the Kew Bulletin, it was stated that the second part was to be published this year. We have now the complete work, which forms a very valuable contribution to our knowledge of the orchids of Tropical America.

The high standard reached in the first part is fully maintained in this part which deals with many of the more striking and bizarre members of the family. All the genera and many of the species are again beautifully illustrated, the general arrangement of the text following that of the first part.

A very complete index of accepted names and synonyms concludes the book. Altogether Dr. Correll is to be congratulated on the production of a first-class account of the orchids of this especially interesting region.

V. S. SUMMERHAYES.

* *Vegetable Tanning Materials*, by F. N. Howes. Pp. XI + 325, 16 plates, 10 figs. Butterworths Scientific Publications, 1953. Price £1.15.0.

† *Orchids of Guatemala* by Oakes Ames and Donovan Stewart Correll [Part 2]. *Fieldiana, Botany*, Vol. 26, No. 2, pp. 397–727, 91 figures in the text. Chicago Natural History Museum, 1953. Paper \$4, buckram \$5.

A NEW GENUS FROM THAILAND.

L. L. FORMAN.

In a recent collection sent to Kew from Northern Thailand by Mr. H. B. Garrett, there was a curious, slightly woody herb whose affinities were for some time difficult to recognise. The plant was eventually found to be closely allied to *Dobinea* Buch.-Ham. ex D. Don, a very distinct genus which has been referred to the *Anacardiaceae*. Two species of *Dobinea* have been described, one from the Eastern Himalayas, the other from Yunnan. The Thai plant is described below as a new genus.

Campylopetalum *Forman* gen. nov. *Anacardiacearum*; a *Dobinea* Buch.-Ham. ex D. Don foliis palmatim lobatis, floribus masculis in inflorescentias foliaceo-bracteatas symmetricaliter ramosas dispositis, petalis filiformibus superne pubescentibus inferne glabris basin versus geniculatis, antheris apice apiculatis lineari-oblongis neque rotundato-ovatis, pistillo nullo, floribus foemineis disco subnullo, stylo longissime filiformi, fructu haud alato recedit.

Campylopetalum siamense *Forman* sp. nov.

Herba perennis (vel suffrutex) 1.5 m. alta, dioica, radicibus fibrosis, caulibus teretibus longitudinaliter striatis glabris pallide viridibus 2-3 mm. diametro ut videtur simplicibus in sicco supra nodos contractis basin versus lignescentibus internodiis circiter 5-6 cm. longis. *Folia* longe petiolata, petiolis usque 10 cm. longis subglabris demum plerumque reflexis, exstipulata, opposita, decussata, membranacea, ut in icone palmatim trilobata, 8-13 cm. longa et 7-13 cm. lata, superiora saepe minora, apicibus loborum caudatim acutis, margine praeter basin serrata, subtus nervis leviter hispida ceterum glabra, domatiis in axillis nervorum principalium, supra sparsissime hispida nervis leviter puberulis. *Inflorescentia mascula* paniculata, terminalis, inflorescentiis partialibus oppositis pedunculatis ex axillis bractearum parvarum ortis; inflorescentiae partiales ut in icone velut trichotome ramosae, ramis ultimis exterioribus bractea unica membranacea magna oblongo-ovata apiculata 4.5-6.0 cm. longa et 1.75-2.25 cm. lata apice basique rotundata pallide viridi vel demum subpurpureo-rosea utrinque subglabra longe petiolata praeditis. *Flores masculi* apice ramulorum terni congesti, triade utraque ex axilla bractae minutae unicae orta, flore medio praecociore, pedicellis filiformibus sub anthesin 6 mm. longis puberulis. *Calyx* campanulatus, 1 mm. longus, dentibus 4 acutis triangularibus coronatus. *Petala* 4, elongato-filiformia, 4 mm. longa, basin versus geniculata, superne dense puberula, infra geniculum glabra, aestivatione implicato-valvata. *Stamina* 8, biseriata, 4 exteriora ante 4 interiora et elongata et dehiscencia, filamentis demum 2 mm. longis linearibus primum brevioribus plus minusve clavatis, antheris 0.5 mm. longis extrorsus longitudinaliter dehiscens, thecis elongato-ellipsoideis leviter puberulis. *Inflorescentia foeminea* terminalis, paniculata, ut in icone ramosa. *Flores foeminei* velut racemosae, ex axillis bractearum orti, bracteis sub anthesi ovatis acuminatis sub fructu accrescentibus subrotundatis membranaceis apice plus minusve retuso-apiculatis dorso pilis simplicibus et glanduliferis

intermixtis satis dense pubescentibus : pedicellus ad bracteam adnatus. *Perianthium* nullum. *Discus* obsoletus in anulum levissime incrassatum redactus, pilis glanduliferis paucis minutissimis indutus. *Ovarium* ambitu lenticulare ovatum uniloculare. *Stylus* filiformis, elongatus, usque 8 mm. longus, ut videtur flagelliformis, unilateraliter et longitudinaliter canaliculatus, basi canalis gibbere minuto praeditus. *Ovulum* solitarium anatropum, basi affixum. *Fructus* lenticularis, circiter 2 mm. longus et 3 mm. latus, reticulato-rogosus. *Semina* laevia, testa membranacea, radícula erecta.

THAILAND: Doi Chiengdao, Me Na Lao drainage, c. 690 m., 22 Dec. 1951, *Garrett* 1379 holotype in K. isotypes in A. L. P. Same locality, 26 Dec. 1952, *Garrett* 1398.

The habit of *C. siamense* is described by Mr. Garrett *in litt.* as 'certainly not a shrub in the ordinary sense'. The second collection *Garrett* 1398 includes stem bases and roots which indicate that the plant is a perennial herb or subshrub with the stems unbranched, except at the base, and becoming woody below. The habit appears to be similar to that of *Dobinea delavayi* (Baill.) Baill.

The trilobed leaves are palmately trinerved at the base and contrast with the unlobed, pinnately nerved leaves of *Dobinea*. There is a distinct tendency in *D. delavayi*, however, for the lateral nerves to be closely crowded together at the base of the leaf, thus approaching the condition of palmate nervation. Domatia are well developed in the axils of the principal nerves in *Campylopetalum*: they are also present in *Dobinea*, more noticeably in *D. delavayi*. Bulbous-based hairs on the upper surface of the leaf are also found in both genera.

The male inflorescence has a general appearance of being repeatedly trichotomously branched (Fig. 1, A), but at each point of branching the two lateral branches are each associated with a bract, while the central 'branch' is a continuation of the axis. The branching is therefore lateral and opposite, and the same pattern is repeated in the lateral branches and in the continuing axis.

The two conspicuous petioled bracts in each partial inflorescence (Fig. 1, B) are of some morphological interest. At their points of origin they do not subtend any branches, since the two lateral branches which arise there are already each subtended by a minute bract similar to those found in the central part of the partial inflorescence. The lowest pair of branches in the partial inflorescence are, however, not subtended at their bases by bracts. It therefore appears that the large petioled bracts must subtend morphologically the lowest pair of branches, and that fusion has occurred between parts of these branches and the bract petioles. Unfortunately, it was not possible to prepare adequate transverse sections in order to provide anatomical evidence for this.

Each partial inflorescence terminates at one level in nine branches on which the triads of flowers develop centripetally. The young triads on each branch are crowded together at the apex (Fig. 1, C), but elongation of the axis from below separates the older triads. When the flowers drop off, the bases of the pedicels remain on the axis as short stumps. Although the axis thus develops indeterminately, the individual flowers are arranged determinately: they are in triads, the central flower being

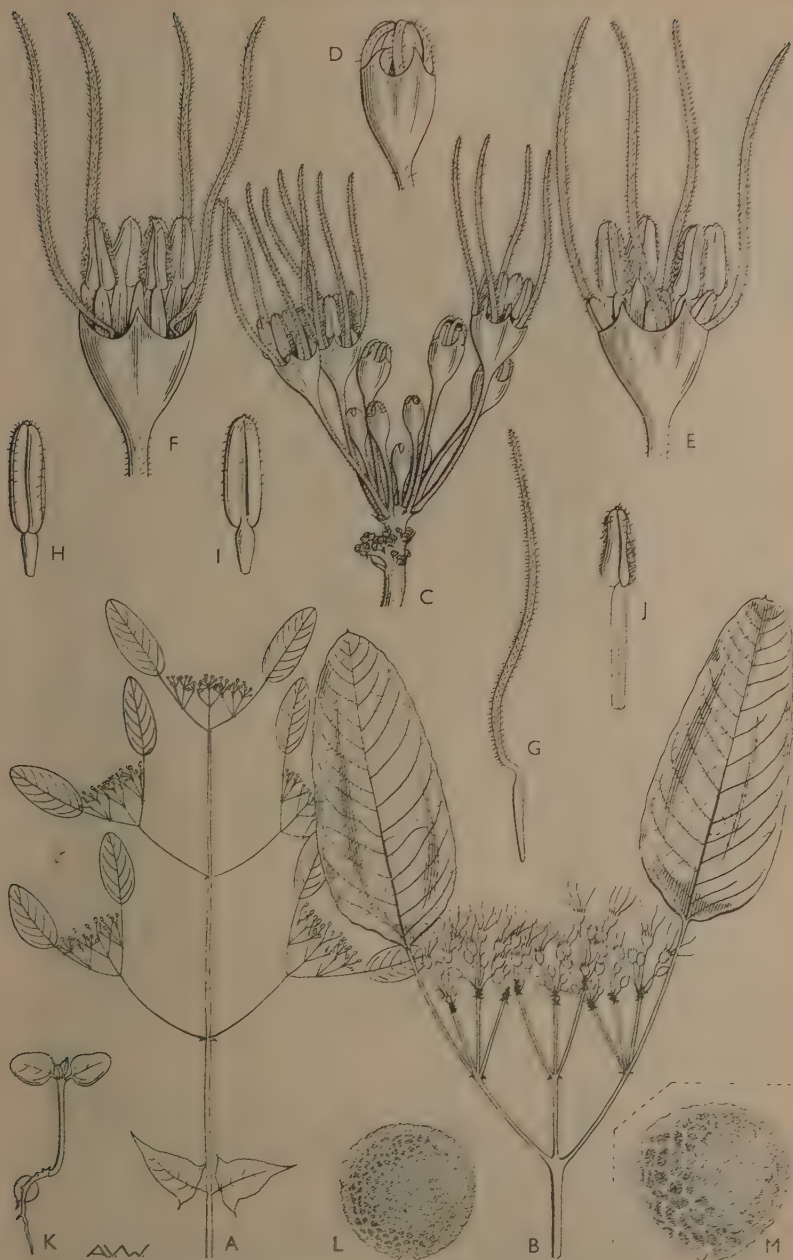


FIG. 1. A L, *Camphylopetalum siamense* Forman—Male plant: A, Inflorescence $\times 1$; B, Partial inflorescence $\times 1$; C, Ultimate part of inflorescence $\times 4$; D, Bud. $\times 8$; E, Young flower, outer stamens dehiscent $\times 8$; F, Older flower, inner stamens dehiscent $\times 8$; G, Petal $\times 8$; H, Abaxial and I, adaxial faces of stamen in bud (both $\times 8$); J, Abaxial face of mature stamen $\times 8$; K, Seedling $\times 1$; L, Pollen grain $\times 1800$. M, *Dobinea vulgaris* Buch.-Ham. ex. D. Don—pollen grain $\times 1800$.

the oldest. Each triad is subtended by a single, median, linear bracteole. The whole organisation of the male inflorescence, characterised by the symmetrical branching, the arrangement of the flowers and the presence of large petioled bracts, give it a totally different appearance from that of *Dobinea*.

The two whorls of stamens do not develop at the same time, as in *Dobinea*, but the outer whorl elongates and dehisces first (Fig. 1, E), later the inner whorl develops, while the anthers of the outer whorl fall off (Fig. 1, F). The anthers dehisce extrorsely and the filaments are attached adaxially. All these characters, together with the apiculate anthers and elongate thecae, make the stamens very different from those of *Dobinea*. The extrorse dehiscence is particularly noteworthy, for in the *Anacardiaceae* dehiscence is always described as introrse, as it is in *Dobinea*.

The petals are most distinctive in being filiform with a pronounced geniculation in the lower part (Fig. 1, G). In the bud the geniculation is hardly visible, but it becomes conspicuous later. The part of the petal above the geniculation is pubescent. The aestivation is implicate-valvate, i.e. the petals meet at the apex of the bud and, without overlapping, their tips bend down into the centre of the bud between the stamens. In *Dobinea* the aestivation is similar, but there the petals are elliptic to oblanceolate and glabrous. There is no sign in the male flowers of the rudimentary pistil present in *Dobinea*.

The female inflorescence is a loose panicle composed of densely flowered racemes (Fig. 2, A). The conspicuous petioled bracts seen in the male inflorescence are absent. The development of the racemes is centripetal, with the axis elongating in the region of the older flowers below, thus separating the developing fruits (Fig. 2, D). The short pedicel of each naked flower is adnate to its subtending bract (Fig. 2, E-F), which bears on its dorsal surface unicellular and multicellular glandular hairs (Fig. 2, H). In contrast to the well developed disc in *Dobinea* there is only a slight suggestion of a disc here in the form of a faint ring bearing a few glandular hairs around the base of the ovary (Fig. 2, F and I). The style, which is four to eight times as long as in *Dobinea*, has a lateral, longitudinal groove arising from between the base of the style and a minute knob-like process on the ovary (Fig. 2, G). This minute knob, which is absent in *Dobinea*, may be the rudiment of another branch, or of other branches, of the style, in which case the present style could have evolved from a bifid or multifid style with a stigmatic surface on the inner face of each branch.

As the fruit develops, the subtending bract enlarges, becoming transparently membranous and strongly nerved (Fig. 2, J). Meanwhile, the surface of the ovary becomes reticulate and pubescent. The mature fruit is not winged at the margin as in *Dobinea*.

Seeds collected in Thailand in February 1953 were sown at Kew 11 days later. Kept at a temperature of about 26° C. they germinated in 7 days. The seedling is hypogeal (Fig. 1, L); the cotyledons often carry up with them the split pericarp. The first 2—3 pairs of leaves are ovate and not lobed.

Mr. Garrett states (*in litt.*) that the soil in which *C. siamense* was growing is limestone and that the following plants were growing nearby (the

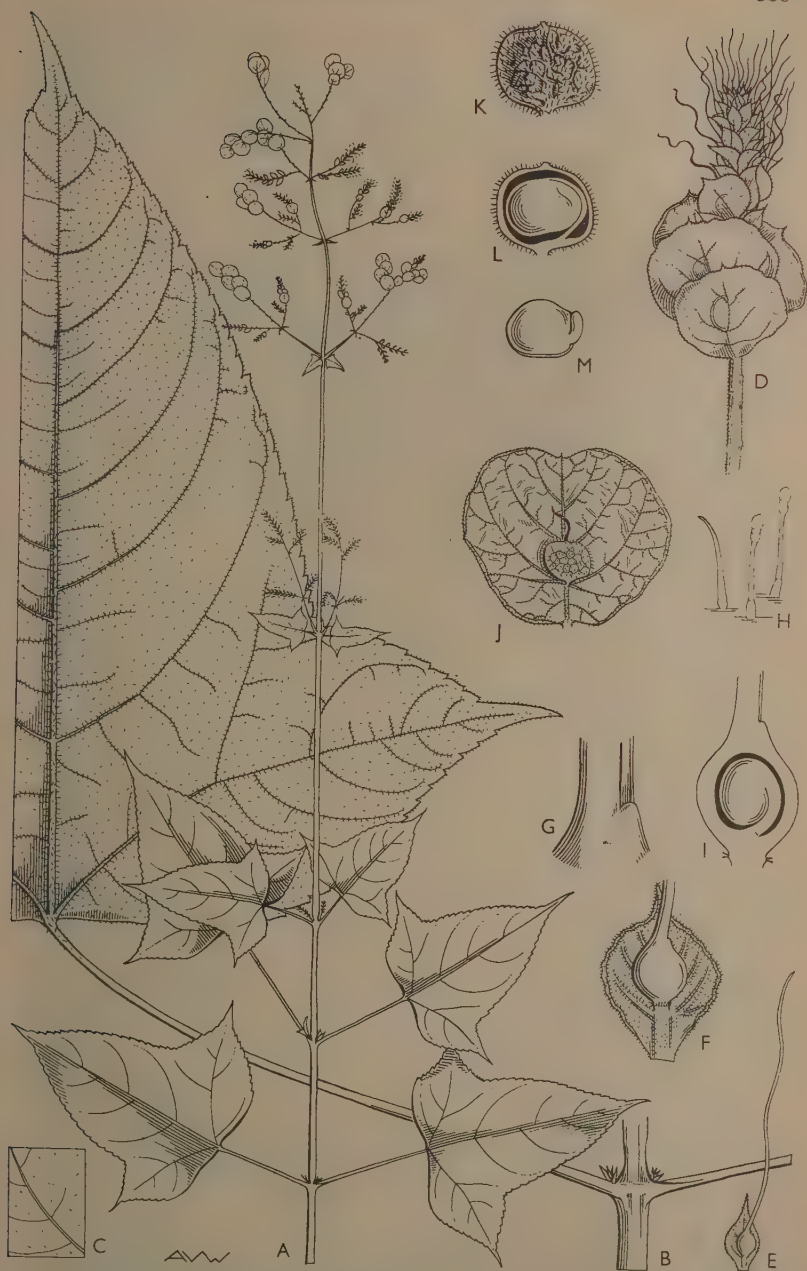


FIG. 2. *Campylopetalum siamense* Forman—Female plant : A, Habit ($\times 1$) ; B, Leaf, lower surface ($\times 1$) ; C, Leaf, portion of upper surface ($\times 1$) ; D, Ultimate part of inflorescence ($\times 2$) ; E, Flower ($\times 6$) ; F, Part of flower ($\times 12$) ; G, Base of style ($\times 48$) ; H, Hairs on abaxial surface of floral bract ($\times 100$) ; I, Ovary in L.S. ($\times 24$) ; J, Fruit with bract ($\times 2$) ; K, Fruit ($\times 4$) ; L, Attachment of seed in fruit ($\times 4$) ; M, Embryo ($\times 4$).

numbers quoted are Garrett nos.) : 1400 *Crotalaria kurzii* Baker ; *Dendrocalamus membranaceus* Munro ; 1299 *Ficus* sp. ; 1373 *Liparis longipes* Lindl. ; 1332 *Macaranga* sp. ; 1378 *Paederia pallida* Craib ; 1402 *Parasympagis* sp. nov. ; 1284 *Piper boehmeriaefolium* Wall. ; 1374 *Tetrastigma hookeri* Planch. ; 1372 *Thunbergia hosei* C. B. Clarke.

AFFINITIES

(a) *Anatomy.*

A brief account will first be given of the history of the systematic position of *Dobinea* with particular reference to anatomical investigations.

The earliest known species of *Dobinea*, *D. vulgaris* Buch.-Ham. ex D. Don, was described from Nepal (Don, 1825, 249). This plant, which is a shrub with simple, opposite leaves, was placed by Don in the *Acerinae* (*Sapindaceae*)—now *Aceraceae*. In the course of his anatomical studies of the *Sapindaceae*, Radlkofer (1888) examined *Dobinea* and found it to have resin canals in the phloem and the general anatomy typical of the *Anacardiaceae*. Since he considered the morphological features also consistent with this family he proposed transferring the genus from the *Aceraceae* to the *Anacardiaceae*.

Meanwhile, a second species was described as a new genus from Yunnan by Baillon (1887 ; 1889) under the name *Podoon delavayi* Baill. This plant is a subshrub (i.e. with annual herbaceous stems and woody rootstock) and has alternate leaves. Baillon was uncertain about its systematic position ; he suggested that it might be placed at the end of *Sapindaceae* as a reduced type. It was investigated anatomically by Morot (1889) from herbarium specimens and seedlings grown at Paris. He considered its affinities to be with the *Anacardiaceae* and *Sapindaceae* but thought that the anatomical and morphological characters justified the creation of a special family, *Podoonaceae*.

When an account of Delavay's collections in Yunnan was published by Franchet, a full description of *Podoonaceae* Baill. ex Franchet was given, and of its one genus and species (Franchet 1889, 145–146, tt. 32–35). In the following year, Baillon (1890) recognised that *Podoon* was not generically distinct from *Dobinea*, but he still preferred to maintain a separate family between *Anacardiaceae* and *Sapindaceae* for this group. At the same time, with regard to Radlkofer's investigations, Baillon also considered it possible that *Dobinea* could be referred to the *Anacardiaceae* as an abnormal genus. His last words on the subject were : ' Botanists will choose.'

Radlkofer (1890, 339) thought there was no sound basis for maintaining a separate family for this ' thoroughly Anacardiaceous genus ', and Morot (1890), whose attention had now been drawn to *Dobinea*, agreed with Radlkofer and proposed that a special tribe be constituted in the *Anacardiaceae* for the two genera (he considered *Podoon* and *Dobinea* to be distinct genera). Engler (1892, 177–178) in the *Pflanzenfamilien* followed this suggestion by creating the tribe *Dobineae*.

In his studies of the *Sapindales*, Heimsch (1942, 142) examined the anatomy of *Dobinea delavayi* (Baill.) Baill. and found it consistent with the rest of *Anacardiaceae*. He stated that there are no anatomical characters

or combinations of such characters that differentiate one group from the others in this family.

The anatomy of *Campylopetalum* was kindly examined by Dr. C. R. Metcalfe from herbarium material of Garrett 1379. He informs me that the microscopical characters appear to be consistent with its being included in the *Anacardiaceae*.

(b) Pollen Morphology.

The pollen of *Campylopetalum* (Fig. 1, L) is easily distinguished from that of *Dobinea* (Fig. 1, M) by the smaller grains and much finer surface reticulation. I am greatly indebted to Dr. G. Erdtman who kindly provided the following pollen diagnoses :

***Campylopetalum siamense* Forman** (THAILAND ; Garrett 1379) : pollen grains 3 (-4)-colporate, (suboblate-) oblate spheroidal ($10.5 \times 11.5\mu$). Exine about 1μ thick ; sexine about as thick as nexine or slightly thicker, finely reticulate (total area of muri about as large as total area of lumina ; muri probably simplibaculate) ; OL-pattern. Colpi $4-5\mu$ long. Mesoria in polar view much wider than ora ; the margins of the latter not, or only faintly, thickened. Amb circular (-slightly subtriangular, with apertures at the angles), provided with about 20 bacula per mesocolpium.

***Dobinea* Buch.-Ham. ex D. Don** (comprehensive diagnosis). Specimens studied : *D. delavayi* (Baill.) Baill. (YUNNAN ; Maire 6734). *D. vulgaris* Buch.-Ham. ex D. Don (NEPAL ; Wallich s.n., 1830 : SIKKIM ; Treutler 535, 10.8.1874) : pollen grains 3 (-4)-colporate (in *D. delavayi* 3-colporate), suboblate-oblate spheroidal ($13 \times 15.5\mu$, $11.5 \times 13.5\mu$ and $14 \times 15.5\mu$ respectively). Exine $1.5-2\mu$ thick ; sexine thicker than nexine, reticulate (total area of muri as large as that of lumina or slightly less ; muri simpli- or more often, dupli-baculate) ; OL-pattern. Colpi $5.5-6\mu$ long. Ora in polar view as wide or wider than mesoria ; their margins conspicuously thickened. Amb circular (-slightly subtriangular, with apertures at the angles), provided with 12-15 bacula per mesocolpium.

Radlkofer (1888) noted that the pollen of *Dobinea* is unlike that of most *Anacardiaceae*. Erdtman (1952, 48) distinguishes in this family three types of pollen, one of which he calls the *Dobinea*-type represented solely by *Dobinea*. At the conclusion of his account of the *Anacardiaceae* he states : 'Pollen morphology . . . is in favour of excluding *Dobinea*.' Dr. Erdtman informs me (*in litt.*) that the pollen of *Campylopetalum* falls into the *Dobinea*-type and he continues : 'At present I cannot see any points in the pollen morphology of *Campylopetalum* and *Dobinea* which could support a supposed affinity to the rest of the *Anacardiaceae*.'

(c) Cytology.

Mr. R. Carolin has made cytological preparations from root-tips of the seedlings growing at Kew. I am very grateful to him for the following observations :

'*Campylopetalum siamense* has a diploid chromosome complement of 14 ; the chromosomes are very small and the morphology is difficult to

study. Ten of the chromosomes have sub-median constrictions, and two bear satellites.

The number is primitive but the positions of the constrictions indicate advancement.

The number does not agree with any of the others so far determined in the *Anacardiaceae*, i.e. $2n = 30, 32, 42$ and 60 (Darlington and Janaki Ammal 1945).⁷

As cytological information about the *Anacardiaceae* is at present so incomplete, it is clearly not possible to draw any reliable conclusions concerning the affinities of *Campylopetalum* from its cytology.

	Dobinea	Campylopetalum siamense
Leaves	Pinnately nerved, not lobed.	Palmately 3-nerved, 3-lobed.
Male inflorescences :		
<i>Branching</i>	Asymmetrical.	Symmetrical.
<i>Bracts</i>	All small and linear.	Two forms—(1) large, petioled and foliaceous, (2) minute.
Male flowers :		
<i>Calyx</i>	Teeth obtuse.	Teeth acute.
<i>Petals</i>	Elliptic to oblanceolate. Straight. Glabrous.	Filiform. Geniculate below. Pubescent.
<i>Stamens</i>	Both whorls develop at the same time.	Outer whorl elongates and dehisces before inner whorl.
<i>Anthers</i>	Emarginate or rounded at apex. Thecae oval to sub-orbicular. Glabrous. Introrse.	Apiculate. Thecae elongate. Slightly pubescent. Extrorse.
<i>Rudimentary pistil.</i>	Present.	Absent.
Female flowers :		
<i>Disc</i>	Prominent.	Inconspicuous.
<i>Style</i>	About 1.5 mm. long. Straight at base.	About 8 mm. long. Minute knob at base.
Fruits	Winged at margin.	Not winged at margin.
Pollen grains	11.5–15.5 μ in. diameter. Coarsely reticulate (12–15 bacula per mesocolpium).	10.5–11.5 μ in diameter. Finely reticulate (20 bacula per mesocolpium).

Summary of the characters distinguishing *C. siamense* from *Dobinea*.

(d) *Conclusions*

Except for the naked female flowers, the morphological characters of *Campylopetalum* and *Dobinea* fall within the range of characters found in the rest of the *Anacardiaceae*. Absence of the perianth is not unknown in this family for there is considerable reduction in *Pistacia*, where the flowers may also be naked (Engler 1892, 157). A number of characters found in the two genera in question are unusual, or very unusual, for the *Anacardiaceae*—but not unknown there; e.g. opposite leaves always occur in *Bouea* and a suffruticose habit can be found in some species of *Rhus*. The formation of the fruit on an expanded bract acting as a wing is a character not found in the *Anacardiaceae*; but again the value of this difference seems little, since winged fruits do occur in this family; moreover the wings are developed from completely different organs in different genera, e.g. from the petals in *Melanorrhoea* and *Swintonia*, the calyx in *Parishia*, and the ovary wall in *Smodingium*. This technical agreement of morphological characters with the *Anacardiaceae* is further supported by the anatomical findings.

It is of great interest that the pollen of both genera show no affinity with that of other *Anacardiaceae* so far studied. (It must be remembered that only about 10 of the 60 genera have yet been examined). This may indicate that the *Dobineae* (i.e. including *Campylopetalum*) are not as closely related to the rest of the *Anacardiaceae* as the other tribes are to one another. If this is so, the presence in the *Dobineae* of several morphological characters unusual for the whole family has some significance, and the revival of the *Podoonaceae* Baillon ex Franchet may be desirable.

I feel that the question of a revival of the *Podoonaceae* cannot be satisfactorily settled solely on gross morphological grounds. Comparative evidence from studies of pollen, anatomy, cytology and embryology is needed, and at present our knowledge of the *Anacardiaceae* in these fields is little. I therefore consider that, for the present, *Campylopetalum* would be best placed with *Dobinea* in the *Anacardiaceae* (tribe *Dobineae*).

Besides the acknowledgements already mentioned I wish to express my gratitude particularly to Mr. J. P. M. Brenan and Mr. A. A. Bullock and also to others at Kew for useful discussions and assistance in preparing the Latin description; appreciation is due also to Miss Ann Webster for her excellent illustrations.

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The alleged Rust on *Ajuga reptans*.

R. W. G. DENNIS and N. Y. SANDWITH.

On page 203 of his *Flora of Berwick-upon-Tweed*, 1829, George Johnston published the following brief diagnosis which has puzzled all subsequent uredinologists:—"33. *M. Labiatarum*, spots small, circular, dark brown, scattered, encircled by the ruptured epidermis; capsules globular, brown, minutely pedicled. Hook. Scot. ii. 15. Grex. *Fl. Edin.* 436. *Hab.* On the leaves of *Ajuga reptans* in autumn."

The "*M*" is a misprint for "*U*.", signifying *Uredo* and the references cited both refer to *U. menthae* Pers. on *Mentha* spp. Hence Johnston's statement that he had a rust on *Ajuga* rests on his own authority alone and no subsequent collector has found a uredine on this plant.*

Plowright (1889) assigned Johnston's fungus to *Puccinia menthae* Pers. without, however, seeing the specimen concerned. Grove (1913 p. 172) stated "Nothing seems to be known about the form on *Ajuga reptans* mentioned by Plowright, from Johnston's *Flor. Berwick.*" Wilson (1934) repeated Grove's comment and, as he had searched Johnston's herbarium in the Municipal Museum, Berwick, it may be assumed that no voucher specimen was found there. Recently, while searching for early British rust collections at Kew, we found a sheet derived from the W. J. Hooker herbarium which enables us to solve this ancient problem. It bears 3 small radical leaves labelled in pencil "88 *U. Labiatarum* ? *Ajuga reptans*" to which Klotzsch has added in ink "Dr. Johnston *Caeoma Labiatarum* Lk. 13".

In fact the rust is not a *Caeoma*, nor is the host a Labiate. The leaves are those of *Valeriana dioica* L. and the rust is the uredo state of the common *Uromyces valerianae* Fuckel.

W. B. Grove. 1913. *The British Rust Fungi*, Cambridge.

C. B. Plowright. 1889. *A Monograph of the British Uredineae and Ustilagineae*, London.

P. & H. Sydow. 1924. *Monographia Uredinearum* 4. Lipsiae.

M. Wilson. 1934. in *Trans. Bot. Soc. Edinburgh* 31 Pt. 3.

* *Uredo Ajugae* Kirchn. 1856 was an error according to the Sydows (1924 p. 565). Nach dieser Beschreibung ist nicht zu entscheiden, was für einen Pilz Kirchner vor sich gehabt hat, wahrscheinlich überhaupt keine Uredinee!

A NEW SPECIES OF PARASYMPAGIS ACANTHACEAE FROM THAILAND.

C. E. B. BREMEKAMP (Utrecht).

Parasympagis garrettii Brem. sp. nov., maxime ut *P. Kerrii* Brem. sed foliis oppositis paulum inaequalibus vel subaequalibus, lamina numero minore nervorum instructa, spicis brevioribus, bracteis pro rata latioribus, bracteolis et calycis lobis brevioribus, granulis pollinis minoribus, capsula minore ab ea recedens.

Planta ramosa. *Caulis* ramique obtuse quadrangulares et quadrisulcati, ad nodos parce pilosi, ceterum glabri. *Folia* quoque pari paulum inaequalia vel subaequalia: lamina elliptico-lanceolata, apice caudato-acuminata, basi sensim in petiolum contracta, margine crenato-dentata, tenuis, supra viridis, sparse hirtella et cystolithis parvis et gracilibus dense lineolata, subtus violacea, costa nervisque pubescens et cystolithis parvis vix conspicue lineolata, nervis utroque latere costae 6-8. *Spicae* breves, solitariae vel interdum in triades dispositae, 7-14 mm. longae et 7-11 mm. diam.: bracteeae 5 mm. longae et 3.2 mm. latae, 5-nerviae: bracteoiae 4 mm. longae et 1.1 mm. latae, apice virides. *Calyx* 5.5 mm. longus, lobis 0.7 mm. latis apice viridibus. *Corolla* alba, 14 mm. longa, tubo 7 mm. longo, faucibus 3.5 mm. longis, lobis 3.5 mm. longis. *Granula pollinis* 44 m. diam., virgis 15 ornata. *Capsula* 5 mm. longa.

THAILAND. Doi Chiang Dao, Me Na Lao, alt. 720 m., leg. H. B. G. Garrett 1402, type (K, dupl. U).

This new species comes very near to *P. Kerrii* Brem., but differs in the subequal leaves, which are provided with a smaller number of nerves, in the much shorter but comparatively wider spikes, the shorter bracteoles and calyx, and the smaller size of the pollen grains and of the capsule. From *P. Wallichii* Brem. *Strobilanthes imbricata* Nees quoad specimina in Birmania lecta it is easily distinguishable by the nearly total absence of the indumentum. In the subglobose form of the spikes it shows a rather striking resemblance to the species of *Strobilanthes* and *Parastrobilanthes*, from which it differs in the presence of annulate hairs on the parts of the testa outside the areola: from the *Strobilanthes* species it differs moreover in the 4-seeded capsule and in the structure of the bands on the surface of the pollen grains, which are not septate but reduced to the raised and somewhat undulating margin. On account of these characters it has to be included in *Parasympagis*.

The Changing Flora of Britain.*—This volume is not a "Flora", in the sense of a book in which plants can be identified, but consists of papers read by a number of well known botanists at the Conference of the Botanical Society of the British Isles in 1952, and covers an extensive subject in most of its ramifications. Space forbids the detailed citations of examples or authors, but the contributions fall into two main categories. Firstly papers dealing with the slowly-operating natural factors causing change in the flora: evolution as shown in the gradual differentiation of species and modifications due to climatic changes. The differentiation of species is extremely difficult to observe and relatively

few examples are given but modern research has added immensely to the knowledge of climatic history. Past climatic changes have caused the gradual replacement of Arctic tundra by temperate woodland on the retreat of the Ice Sheets and the later amelioration of the climate ; mostly by the addition of immigrant species from the Continent. Arctic, alpine and montane species have retreated towards the mountains of the north and west or been exterminated giving the mountain floras of Britain and Scandinavia a common prehistory. Pollen analysis and the examination of other sub-fossil remains as well as the study of the present distribution of various, generally rare or local, species, provide evidence of the course of this great change, and help to interpret the significance of the North American, Lusitanian and Continental elements in the British flora.

The second, and nowadays equally important, class of changes are those made directly or indirectly by man. The fields, hedges, much of the woodland as well as the moorlands are man-made communities or natural communities much modified by man and his livestock. In these communities many native species, once restricted to relatively small areas in marginal or seral communities have been able to increase in numbers of individuals and have so become some of the commonest of plants. It is in forming fairly open habitats, such as waste-places or cultivated lands, where the competition is much less than in a closed natural community, that an opportunity is provided for the invasion of alien plants. Such plants come from most parts of the world and are introduced in many ways—as escapes from cultivation (ornamental, drug and food plants) and accidentally introduced weeds—in seeds for farm and garden, grain imported as human or livestock food, in fodder, in wool imported for manufacture, and in other ways. Some of the aliens so introduced remain as weeds of cultivated or recently disturbed land ; others have been able to establish themselves with varying success in natural or semi-natural communities. Some once familiar cornfield species are now rare, due to the better screening of grain, but improved communications with other countries have brought in many species in relatively recent times. Woody plants which are aggressive at the expense of the native species have generally come from stock originally planted as ornamental trees and shrubs. The difficulties of deciding whether a species is “ native ” or “ introduced ” (in some ways a rather artificial distinction) are especially great in those species which appear to occur both as native relicts and more commonly as introduced ruderals.

As well as the above two types of change there are those native or possibly native species, which though presumably present since prehistoric times, have only recently been detected. For the sake of comparison there are papers on the floristic changes in the Valois, where in general the same factors have been at work as in Britain ; on glacial relicts in the Netherlands ; and on some zoological effects of the changes in shelter and food supply. An account of the work of the Nature Conservancy is included. There is little discussion of any possibility of climatic variations within historic times. This wide scope of information makes the book easy to recommend to any botanist who studies the history or current fluctuations of the British flora. R. A. BLAKELOCK.

* The Changing Flora of Britain, edited by J. E. Lousley, Pp. 1-204 ; 6 photograph plates and 25 maps and diagrams. T. Buncle and Co. Ltd., Arbroath, 1953. Price 15/-.

CHINESE GOOSEBERRY.

BARBARA J. YOUNGMAN.

During the last two summers what is to most people a new or a strange fruit has been on sale in the London area and certain other parts of the country. The fruit is the Chinese gooseberry (*Actinidia chinensis*) which is now being produced commercially in New Zealand (North Island) and exported to Britain.

As the name indicates the plant is a native of China occurring naturally on the forest margins of the Yangtze Valley. It is a vigorous vine climbing by self twining. Under favourable conditions it may reach a height of thirty feet. The plant is dioecious, both male and female flowers being cream in colour, up to two inches in diameter and pendulous on long stems. The Chinese Gooseberry was first brought to the notice of Europeans by Robert Fortune in 1847, when he was travelling in China for the Royal Horticultural Society. It was not cultivated in Europe however until 1900, when seeds were sent by Wilson, while collecting in Hupeh. The plant proved to be fairly hardy and was reported as having flowered for the first time in England in 1909. It is, however, usually grown for its large decorative leaves rather than for the flowers or fruit. Although the vine is known to flower freely, fruit is not often produced in the British Isles for the plant is dioecious and usually only solitary specimens are planted. Where male and female plants have been grown together, however, fruit has been readily produced. In Hampshire in particular, free fruit production has been recorded. The fruits are gathered in November after the leaves have fallen and are ready for dessert by December. The Chinese Gooseberry thus ripens during the winter when supplies of other kinds of fruit are restricted. This is said to be one of the reasons for its popularity for domestic use in New Zealand.

In New Zealand, as in Britain, *Actinidia chinensis* has been grown as a decorative plant for a long time. It is only in recent years that commercial production has been developed in that country and the areas where this is possible are somewhat limited by climatic factors.

Being deciduous, the vines will withstand quite heavy winter frosts but frost at any time during the growing period may cause considerable injury. If it occurs during blossoming it may prevent the setting of the fruit. Early winter frosts do not appear to damage the fruit on the vine and are said to be beneficial in improving the flavour. Deep fertile soils are recommended for successful cultivation. An adequate water supply during the summer months to ensure full development of the berries is necessary. Because of the extremely vigorous growth of the vines pruning is an important consideration. Training on trellis etc. is necessary for ease of handling. Propagation is effected by budding or grafting (by the whip and tongue method) on to seedling stocks. In New Zealand the vines are in flower during October and November but the fruit does not mature until the winter. Picking usually takes place from May to early July. Fruit gathered early in the season is high in pectin but much of this is lost later. On the whole Chinese Gooseberries have been found an easy crop to grow in New Zealand.

Unlike most fruits the Chinese Gooseberry is not attractive externally, having a rough brownish coloured skin covered with short stiffish hairs. Internally the fruit is more attractive, consisting when ripe of a translucent flesh, usually pale green, in which are imbedded numerous small purplish-black seeds. Although there are no named varieties of the Chinese Gooseberry, a number of strains under cultivation show considerable variation in fruit characters. In shape they may be round, oval or elongated. Some are inclined to be rectangular or square. Those imported to Britain from New Zealand have been oval in shape and up to about three inches in length. Some inferior strains of the fruit are said to have an internal fibrous or woody core and the flesh may be nearly white in colour. The fruit has a rich delicate flavour. This has been described as intermediate between a gooseberry and a strawberry and yet reminiscent of the pineapple. It is exceptionally high in vitamin C, the antiscorbutic value being ten times that of the lemon. The early gathered fruit which is high in pectin content is most suitable for making into jams etc. For dessert purposes the fruit is not ready to eat until soft but should not be over-ripe. (The Culture of Chinese Gooseberry Vines by F. L. Bailey. N.Z. Jour. Agric. 80. 223-231, March 1950).

The Encyclopedia of Plant Portraits.*—The object of this book is apparent from its title. It provides more than 1,100 photographs of garden plants illustrating representative species of nearly 1,000 genera. The photographs are arranged in alphabetical sequence under the botanical names of the plants depicted and include hardy and half-hardy plants, trees and shrubs, orchids, ferns and greenhouse plants. A brief description is supplied beneath each picture giving the colour and height of the plant, time of flowering and whether it is annual, hardy herbaceous perennial, shrub, etc. An "Index of Popular and Catalogue Names" has been provided, listing over 800 common names, for those who know the popular but not the botanical names. The nomenclature followed is the same as that adopted in Sanders *Encyclopedia of Gardening* (1952) where all these plants are described in greater detail, but although the present book is primarily intended as a companion volume to that work it will be found most useful as a separate work of reference. It should be of great value to all gardeners.

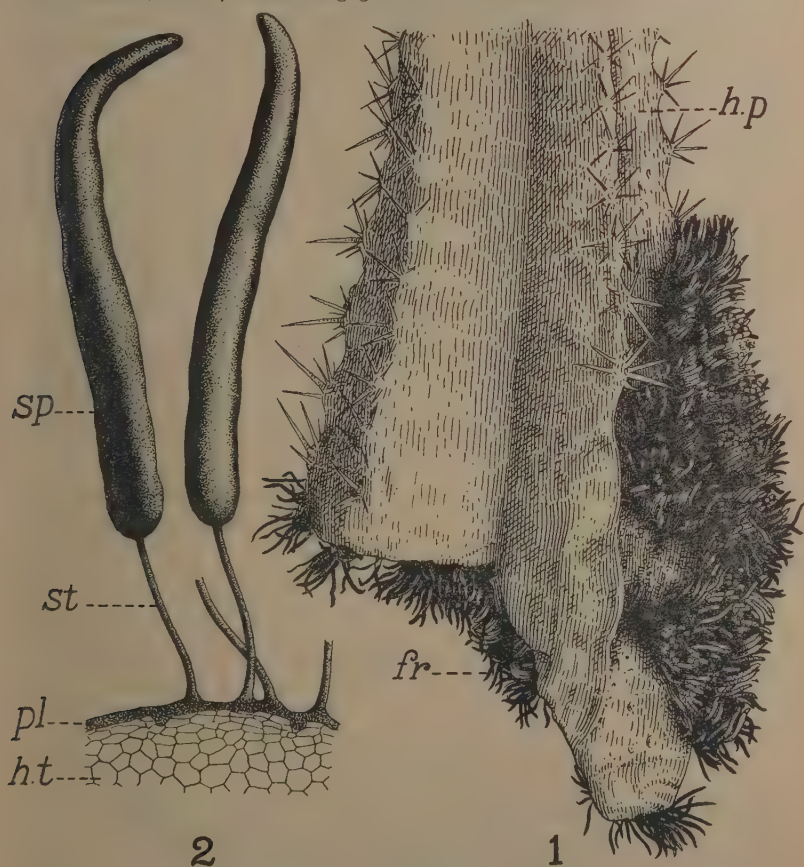
H. S. MARSHALL.

* The Encyclopedia of Plant Portraits. By A. G. L. Hellyer. Pp. vi + 322. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Incorporated. 1953. Price 21/-.

A NEW SPECIES OF STEMONITES PARASITIC ON CEREUS.

N. A. ERADY.

The plasmodium of a Myxomycete, growing on the fleshy stem of *Cereus* (Cactaceae) was recently discovered by the author. The material was collected in August 1952, from South Travancore. The host plant with the vigorously growing plasmodium on its surface, was transferred to the laboratory for investigation. Detailed study of the behaviour of the vigorously growing plasmodium revealed that entry into the host tissues is effected through the stomatal openings in the epidermis. Within a month the Cactus plant turned yellow, and soon there was a profuse production of the fructifications in irregular patches from the surface of the condensed, rather thick, dark brown, resting plasmodium (Fig. 1 and 2). It soon became apparent that it was an undescribed parasitic species of *Stemonites*, a very interesting genus of the Stemonitaceae.



Stemonites travancorensis Erady on *Cereus*.

1. Surface view of a portion of host plant (h.p) showing fructifications (fr) of parasite. $\times 2$.
2. T.S. stem of a part of host plant with parasite. $\times 20$, showing host tissue (h.t) a ; thick hardened plasmodium (pl) ; sporangium (sp) ; and stalk of sporangium (st).

The new Myxomycete is very similar in many respects to the described species of *Stemonites fusca* Roth (1787), but differs essentially in the possession of a light yellow parasitic plasmodium passing through pale violet to dark brown, sporangia with the gradually tapering columella which becomes dissipated just below the tip and the somewhat dark brown capillitial threads which are often membranously flattened at angles. Moreover the spores are covered with closely arranged sharp spines in contrast to the loosely arranged blunt spines or warts of *Stemonites fusca* Roth, which are connected by delicate reticulate ridges (Lister, A. 1925).

The major characters exhibited by the plasmodium and the reproductive structures of the specimen under consideration indicate that this Myxomycete is significantly different from other recognised species of the genus and therefore, the creation of a new species for the allocation of this Myxomycete is warranted. As here defined, the spores, the characteristic colour and the typical growth habit are the distinctive features of the species. The name *Stemonites travancorensis* sp. nov. is proposed for the reception of this Myxomycete. The diagnostic features of the new species may be given as follows :—

***Stemonites travancorensis* Erady sp. nov.**

Sporangia tenuia, cylindrica, aggregata irregulariter in maculas 3–5 cm. vel amplius latitudine, ut plurimum 6–7 mm. altas, fusce brunneas; caulis niger, micans atque distentus ad basim, ut plurimum basi expansa ad tertiam partem totius longitudinis caulis; columella crassa, gradatim fastigiata sursum atque evanescens sub apice; capillitium constans filamentis nonnihil crassis, fusce brunneis, quae libere inter se anastomose conveniunt, atque efformat rete interius haud compactum; capillitium saepe membranacee complanatum ad angulos, rete peridiali irregulari atque compacta; hypothallus continuus, bene evolutus; sporae pallide violaceae transmissa luce, opertae spinis acutis compactis, dimetientes 7–10 μ diam. Plasmodium parasiticum, pallide luteum, evadens primo pallide violaceum ac demum fusce brunneum.

Typus lectus est in loco Trivandrum et Nemom, parasitans *Cerei* plantas, die 12 augusti 1952, a N. A. Erady, et positus in collectione Universitatis Trivandrum.

Type material of *Stemonites travancorensis* has been deposited in the Herbarium of the Royal Botanic Gardens, Kew.

The writer wishes to thank Dr. A. Abraham, for his continued encouragement and advice, and Rev. Fr. H. Santapau, for very kindly putting the description into Latin.

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CLASSIFICATION OF THE BANANAS.

N. W. SIMMONDS

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III. Critical Notes on Species*

t. *Musa erecta* Simmonds sp. nov. Sectio *Australimusa* Cheesman. Planta ingens, latice sufflavo, petiolis basi alatis; inflorescentia erecta, robustissima, frugibus parvis, ovoideis, maturatis flavescenti-rufis; spica mascula maturata perlonga, erecta; gemma mascula magna, obtusa, bracteis nitidis, apice fortiter imbricatis et semipersistentibus, floribus masculis deciduis, sepalo composito albo et luteo, sepalo libero translucido, ovato, apice minute denticulato. *M. fehi* Bertero ex Vieillard affinis, sed colore laticis et structura florum differt.

Plant stooling sparsely, exuding a copious pale yellow juice when cut; *pseudostem* massive, up to 5.5 m. high and 30 cm. thick at the base, the flesh orange-yellow, the sheaths dark green, somewhat marked with dark blackish brown, especially at the base, not glaucous; *petiole* rather short and spreading, 40–50 cm. long, deeply channeled above, the margins spreading, the base prominently wavy-winged; *lamina* oblong-lanceolate, up to 3 m. long and 80 cm. broad, rounded or even somewhat lobed at the base. *Inflorescence* erect, male axis up to 1 m. long; *peduncle* glabrous 5–7 cm. thick; *basal flowers* (7–9 “hands”) female, upper flowers male, neuter transitional “hands” few or none. *Female flowers* biseriate, 16–20 per bract; *ovary* 3 cm. long with ovules biseriate in the locus, about 200 per ovary; *perianth*, the compound tepal 30–35 mm. long, 5-toothed, the free tepal about 25 mm. long, ovate-lanceolate, white, translucent, minutely toothed and acute at the apex; *style* about 25 mm. long; *staminodes* 5, 10–12 mm. long. *Male bud* in advanced blooming borne on a massive erect rachis, narrowly ovoid, broadest towards the base, the tips of the constituent bracts strongly imbricate in the upper one-third, blunt or sub-acute at the apex, about 26 × 12 cm. *Bracts* variably persistent after withering, not rolled, broadly ovate, rounded at the apex, shiny and greenish-yellow within, shiny and green variously flushed with dull brownish-purple without, the colour ranging from a faint marginal flush to a dark solid colour in the portions of the bract exposed to full sunlight, the extreme tip greenish. *Male flowers* biseriate, 24–30 per bract, rapidly deciduous; *abortive ovary* 5 mm., tapering; *compound tepal* 5–6 cm. long, two angled at the back, creamy yellow, yellow at the 5-apiculate-toothed tip; *free tepal* ovate 30 × 10 mm., minutely toothed at the tip, translucent, white, slightly thickened in the middle and curved in section but not ribbed or keeled; *stamens* 5, equal to the compound tepal, creamy white, *anthers* 3 cm. long; *stigma* pale yellow; *style* white. *Fruit bunch* erect, bearing a few persistent withered bracts; *fruit* ovoid, 5 cm. long, green, ripening orange and then bright red, faintly angled, sometimes bearing withered floral relics, narrowed at the base into a short pedicel. *Seed* 3–8 mm. broad × 3–7 mm. deep, variably compressed and irregularly angular, finely striate-ridged, bearing a small but distinct pit in a slightly raised portion (umbo) on the distal face opposite the hilum. *Chromosome number* $2n=2x=20$.

* Continuing the series started by E. E. Cheesman in Kew Bull. 1947 p. 97 and carried on by him in the same Journal until 1950 p. 152.

DISTRIBUTION : Buka Island, northern Solomon Islands (administrative Territory of New Guinea). Described from living plants at the I.C.T.A. Trinidad, B.W.I. ; specimens and drawings have been lodged in the Kew Herbarium.

The description above is based on the I.C.T.A. introductions 200, 201 and 203 received in 1938 from Buka Island off Bougainville in the northern Solomon Islands. Of these introductions, only the first two now survive but all are undoubtedly conspecific though differing slightly in male bract colour and bud shape. They grow poorly under Trinidad conditions (as is commonly the case with the 20-chromosome bananas) but, when they do flower, are sometimes magnificent plants which exceed even *Musa balbisiana* in size. The fruit dimensions given above and the photograph of the fruit bunch may not fairly represent the species, for seed-setting is poor even after artificial pollination. Seed produced at the I.C.T.A. was more irregular in shape than the seed originally introduced from Buka Island ; for this poor seed-setting was probably responsible.

The lowland plant referred to by Kajewski (in MacDaniels, *Bernice P. Bishop Mus. Bull.*, **190** (1941) pp. 42-3) and a seed collection from Choiseul (W. J. Badcock, 1945, I.C.T.A. no. 267, bearing the note that the plant bore an erect bunch) may represent the species, though Badcock's seeds resemble those of Dodds' Malaita plant (see below) more closely than they resemble those of *M. erecta*. Clemens' plant from Morobe, northeastern New Guinea (MacDaniels *loc. cit.*, and his Plate 10B) may also be the same or it may be *M. maclayi* (see below).

An *Australimusa* from Malaita commented upon by Dodds (Nature **157**, 729-30, 1946) is represented at the I.C.T.A. by a seed collection (Introduction 312) which approaches but hardly matches *M. erecta*. Dodds' plant, furthermore, had a subhorizontal bunch and the male flowers (also at I.C.T.A.), though similar to those of *M. erecta*, are larger and somewhat differently proportioned.

Musa erecta evidently has affinity with *Musa fehi* but its flowers are very distinct both from Vieillard's description and from I.C.T.A. specimens from Fiji (coll. K. S. Dodds, 1945); the sap colour too, seems to be an important character and in this connexion it is interesting to note that there is a wild plant with violet sap and an erect bunch in Bougainville (MacDaniels *loc. cit.*, quoting Kajewski). *Musa erecta* and this Bougainville plant would probably repay investigation as possible wild progenitors of the cultivated *M. fehi*.

M. maclayi F. v. Mueller ex Miklouho-Maclay (in *Proc. Linn. Soc. N.S.W.* **10**, 348 (1885) ; F. v. Mueller *ibid.*, 355 ; and Cheesman in Kew Bull. 1950, 28) is a similar banana from New Guinea but is very poorly described. It resembles *M. erecta* in stature and in the "flower stalk upright or but slightly curved" but differs from it in the "narrow, stiff leaves", the few flowers per bract and the short perianth ("nearly an inch in length"). These differences, coupled with the difference in geographical origin, seem to be good grounds for treating the two plants as distinct.

M. hillii F. v. Mueller and *M. fitzalanii* F. v. Mueller, both from Queensland and treated by Cheesman (*Kew Bull.*, **1947**, 111) as *Australimusas*, are both poorly known species that differ from *M. erecta* in several characters—the former in its hermaphrodite lower flowers with pendulous stamens and conspicuously appendaged perianth, the latter in its drooping inflorescence and small, few-flowered bracts.

CLASSIFICATION OF THE BANANAS.

N. W. SIMMONDS

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III. Critical Notes on Species

u. *Musa angustigemma* Simmonds sp. nov. Sectio *Australimusa* Cheesman. Planta alta gracilis, petiolis clausis non alatis, latice pallide subrufescente. Inflorescentia pendula, bracteis floribus femineis persistentibus; gemma mascula angusticylindrica bracteis fortiter imbricatis. Bracteae deciduae vel semi-persistentes, lanceolatae, obtusae, intus flavae, extus rufescenti-flavae, purpureo-striatae, apice interdum desiccatae prius quam evolvuntur; flores masculi decidui numerosi, sepalo composito flavo et rufescenti-flavo, sepalo libero albo, lanceolato, translucido, acuto, integro. *M. peekelii* Lauterbach affinis sed habitu plantae, colore laticis, forma gemmae et magnitudine seminis differens.

Plant stooling strongly, emitting a copious pale dull red juice when cut; *pseudostem* slender, to 6 m. high and 20 cm. thick at base, marked with brown smudges, flesh white, sheaths shiny, not glaucous; *petiole* rather erect, slender, up to about 60 cm. long, deeply channeled above, the margins incurved to form a tube, at the base tightly clasping the pseudostem, not winged; *lamina* oblong-lanceolate, unequally obtuse at the base, up to 250 × 60 cm. *Inflorescence* pendulous, male axis hanging vertically up to a length of about 2 m.; *peduncle* glabrous, 3–4 cm. thick; basal flowers (8–10 “hands”) female, upper flowers male, transitional “hands” one or few. Female flowers biseriate, about 18 per bract, ovary pale green streaked with purple, 50–55 mm. × 10–13 mm. broad, including the short pedicel, ovules biseriate in each loculus, about 190 per ovary; compound tepal 5 cm. long, 5-toothed; *free tepal* lanceolate, acute, 32 × 13 mm., entire at the apex; *style* equal to the perianth; *staminodes* 5, short. *Male bud* in advanced blooming slenderly cylindrical or somewhat tapered to an acute, variably (usually strongly) imbricate tip, three and a half to four times as long as broad, up to 28 × 7 cm. Bracts variably persistent after withering, those in the female region more persistent than those on the male axis which is therefore sometimes naked; *male bracts* lanceolate, blunt, the margins curling back and the tips tending to wither before the bract lifts, not rolled, brilliant shiny yellow within, fading greenish towards the apex, pale orange and shiny at the base without, orange thinly streaked with purple further up and solid dark purple at the tips where long exposed to light, extreme outside tips of young bracts greenish. *Male flowers* biseriate about 24 per bract, rapidly deciduous; *abortive ovary* tapering to base, yellowish, 8 mm.; *compound tepal* 5–6 cm. long, two angled at the back, thickened at the angles, thinner and somewhat translucent at the anterior margins, 5-toothed, pale yellow below, orange yellow above; *free tepal* lanceolate 40 × 10 mm., faintly acuminate, entire, smooth, white, translucent, slightly thickened in the middle and curved in section but not keeled or ribbed; *stamens* 5, equal to the compound tepal, *anthers* 3 cm. long, palely flushed with orange, filaments white; *style* about equal to the compound tepal, stigma yellowish. *Fruit bunch* pendulous or oblique, bearing persistent withered bracts. *Fruit* unknown (not set in Trinidad;

probably, judging from the ovary and knowledge of other *Australimusas*, less than 10 cm. in length, thinly streaked with purple before ripeness, smooth, tapering into a short pedicel). Seed $6 \times 5 \times 3-4$ mm. subglobose, dorsi-ventrally compressed, irregularly subangular and minutely warty-ridged, with a prominent hilum 1.5 mm. in diameter and a slight umbo (sometimes wanting) on the opposite face, hard, brownish in colour. Chromosome number $2n = 2x = 20$.

DISTRIBUTION. Rai coast, Madang, northeastern New Guinea. Described from living plants at the I.C.T.A. (Introduction 194); specimens and drawings have been lodged in the Kew Herbarium.

Musa angustigemma is clearly related to *M. peekelii* Lauterb. from New Ireland (Cheesman in Kew Bull., 1949, 450-2); it differs in ecology (it makes poor growth under Trinidad conditions whereas *M. peekelii* is vigorous), more slender habit, reddish sap, narrower bud shape, predominantly orange bract colour, more numerous male flowers and smaller seeds. *Musa fitzalanii* F. v. Muell. from Queensland, if it were properly known, might also prove to be closely related. The occurrence of a reddish sap in this species may serve as a warning that *Musa fehi* is not the only banana with a red or "violet" juice.

A CORRECTION.

Kew Bulletin No. 3, 1953, page 405.

Delete three paragraphs starting "1. *Ensete edule* and ending "8-10 ft. high." and replace by the following:—

1. ***Ensete ventricosum*** (Welw.) E. E. Cheesman in Kew Bull. 1947, 101 (1947).

Musa ensete Gmel. Syst. Nat. ed. 13, 2 (1791), 567; Baker in Ann. Bot. 7 (1893), 205. Type: from Abyssinia, description and plates in Bruce, Travels in Egypt, Arabia, Abyssinia and Nubia 5 (1790), 36-41.

Musa ventricosa Welwitsch Apont. (1859) 545 & 587, no. 45; Baker in Ann. Bot. 7 (1893) 206. Type: Welwitsch no. 6447, Pungo Andongo, Angola, 1857—"species ab omnibus mihi hujus generis cognitis caule basi bulboso-inflato et bracteis etiam sub statu fructifero persistentibus etc. distincta", in Herb. Kew. In Herb. Mus. Brit. are male flowers (with two additional lobes on the outer tepals, as in our Uganda material) bearing the same number and date and the note "Stem swollen above the ground, 8-10 ft. high."

Ensete edule Horan. Prodr. Scitam. (1862), 40. Type: as *Musa ensete* Gmel.

Throughout the paper, for *Ensete edule* read *Ensete ventricosum* and for *E. edule* read *E. ventricosum*, namely p. 405, line 44; p. 407, lines 14, 47, 51; p. 408, lines 1, 30, 38, 48, 49; p. 409, line 27; p. 410, lines 15, 26, 28, 32, 34, 35; p. 414, lines 9, 46; p. 416, lines 4, 38, 49.

AFRICAN ORCHIDS : XXII*.

V. S. SUMMERHAYES.

The present contribution contains the descriptions of eleven new species and various taxonomic and nomenclatural notes. These deal with plants from the African mainland as well as from Madagascar. The new species include further interesting plants from the rich Gabon collections made by M. Georges Le Testu, particularly in the genus *Bulbophyllum*.

The type specimens of all the new species are in the Kew Herbarium unless stated otherwise.

Habenaria microrhynchos Schltr. in Engl. Bot. Jahrb. **20**, Beibl. 1. 36 (1895).

Herminium natalense Rchb. f. Otia Bot. Hamburg. 108 (1881).

Peristylus natalensis (Rchb. f.) Rolfe in Dyer, Fl. Cap. **5**, iii. 115 (1912).

Platanthera natalensis (Rchb. f.) Schltr. in Engl. Bot. Jahrb. **20**, Beibl. 1. 6 (1895).

Comparison of the type gatherings of the above two species shows that they are conspecific. Owing to the existence of *H. natalensis* Rchb. f. the epithet *natalensis* cannot be used in *Habenaria* for the species here dealt with. It is difficult to understand on what grounds Rolfe placed *Habenaria microrhynchos* and *Peristylus natalensis* in two different genera in Flora Capensis since he had available authentic material of both.

The species is evidently an outlying representative of a group centred in Abyssinia and Kenya Colony, the best known member of which is *Habenaria petitiiana* (A. Rich.) Dur. & Schinz.

Habenaria (§ *Commelynifoliae*) **nigerica** Summerhayes sp. nov. ; affinis *H. obovatae* Summerh. et *H. bequaertii* Summerh., ab illa petalis curvatim lanceolatis, ab hac foliis brevioribus angustioribusque, ab utraque cauli medio crebre foliato, bracteis flores fere aequantibus vel superantibus, antherae connectivo angustissimo satis distinguenda.

Herba terrestris foliata, 20–30 cm. alta, fere omnino glabra ; tuber non visum ; radices e basi caulis exorientes, \pm flexuosae. *Caulis* erectus, triente basali vaginis laxis inclusus, medio foliatus, superne floriferus, teres, 2–3 mm. diametro. *Folia* circiter 10, 4–5 infima \pm in vaginis redacta, 4–5 intermedia \pm patentia, lanceolata, lanceolato-oblonga vel elliptico-oblonga, apice acuta apiculato-acuminata, basi breviter vaginantia, 3–8 cm. longa, 1–2 cm. lata, 1–2 suprema \pm bracteiformia, sub-erecta, textura tenuiter chartacea. *Inflorescentia* 7–12 cm. longa, densiuscule 15–25-flora, circiter 2.5–3 cm. diametro ; bractee foliaceae, lanceolatae, acuminatae, usque ad 3 cm. longae, inferiores flores superantes, superiores flores aequantes vel fere aequantes. *Flores* erecto-patentes, pallide flavido-virides vel viridi-flavi ; pedicellus cum ovario 1–1.5 cm. longus. *Sepalum* intermedium erectum vel paulo incurvatum, late ovatum, acutum, 5–6 mm. longum, 4.5–5 mm. latum, concavum ; sepala lateralia deflexa, oblique semi-ovata, apice acuta leviter recurvata,

*Continued from K.B. 1953, 162.

7.5–8 mm. longa, 2.5 mm. lata ; omnia sepala subquinquenervia, prope apicem marginibus papillato-ciliolatis. *Petala* = adscendentia, oblique incurvatim lanceolata, apice subacuta, superne paulo incrassata, 7 mm. longa, 1.75–2.25 mm. lata, subquadrinervia vel subquinquenervia. *Labellum* deorsum porrectum, dimidio inferiore tripartitum ; pars basalis indivisa 2.5–2.75 mm. longa, circiter 1.5 mm. lata ; partitio intermedia e basi paulo latiore ligulata, apice acuta, 7–8 mm. longa, basi circiter 1.3 mm. lata, carnosula, trinervis, marginibus leviter recurvatis ; partitiones laterales ex intermedio angulo semi-recto divergentes, lineares, e basi usque ad apicem sensim angustatae, 3–6 mm. longae, basi 0.3–0.4 mm. latae, uninerviae ; calcar dependens, inferne cylindricum, dimidio apicali modice inflatum, circiter 10 mm. longum. *Anthera* erecta, 2–2.5 mm. alta, connectivo angusto, loculis leviter divergentibus, canalibus brevibus 0.7 mm. longis ; staminodia clavata, longiuscule stipitata, in toto 1.5 mm. longa, rugulosa ; stigmata deflexim porrecta, cylindrica, vix proprie clavata, 2–2.5 mm. longa ; rostellum lobus intermedius late triangularis, obtusus.

NORTHERN NIGERIA. Zaria Province, Mando Forest Reserve, by Gidan Baraje, in *Isoberlinia doka* open savanna woodland, July 1950, Keay FHI. 25993 (type) ; same locality, by R. Bona, in *Isoberlinia* open woodland, July 1950, Keay FHI. 25986.

This interesting species resembles in general vegetative features some species of sect. *Pentaceras* but differs in the entire petals and the type of lobing of the labellum. The petals in the present species are somewhat thickened and more opaque in the upper portion, agreeing in this respect with the two other species mentioned in the diagnosis and with other species of this sub-group of sect. *Commelynifoliae*. The tall club-shaped stalked staminodes are a striking feature of *H. nigerica* ; these are rather similar to those found in *H. njamnjamica* Kraenzl. which is a member of sect. *Pentaceras*. Taking all the characters of *H. nigerica* into consideration it appears that we have here a plant which is to some extent intermediate between the two sections mentioned though the balance of evidence places it in sect. *Commelynifoliae*.

Habenaria cornuta Lindl. in Hook. Comp. Bot. Mag. **2**, 208 (1837).

H. ruwenzoriensis Rendle in Journ. Bot. Lond. **33**, 280 (1895).

After careful examination of all the specimens in the Kew Herbarium referred to the above two concepts I have come to the conclusion that *H. ruwenzoriensis* was based originally on an abnormal gathering of the older *H. cornuta*, and that the two are therefore conspecific. There are seven gatherings at Kew more or less clearly referable to *H. ruwenzoriensis*, including the type gathering (Scott-Elliott 7923), but of these three are obviously abnormal in floral structure even as compared with the type.

Comparison of all the material makes it evident that the flowers of all seven gatherings are abnormal in some way or another. The features common to all, distinguishing the species from *H. cornuta* Lindl., are the short anterior petal-lobe which is little longer than the dorsal sepal, and the short entire lateral lobes of the labellum, the middle lobe of which, like the posterior petal-lobe, is broader and thinner than the corresponding structure in *H. cornuta*. But examination of the posterior petal-

lobe shows in practically every case the incipient development of an additional anther-loculus on the posterior margin. In some examples this loculus, which takes the form of an elongated doubling of the petal margin, the tissues being brownish and more or less transparent, contains an imperfectly formed pollinium or mass of pollen. In one or two gatherings similar incipient anther-loculi were observed also in the lower part of the middle lobe of the labellum.

I have observed the formation of such anther-loculi on one or more of the three petals (including the labellum) in a number of other species of *Habenaria* belonging to various sections of the genus. The phenomenon is most frequently associated with other abnormalities such as the reduction or suppression of the spur or the malformation of the column, but these have not been observed in the specimens discussed here.

One gathering made at Londiani in Kenya Colony contains two specimens referable to *H. ruwenzoriensis* and one possessing all the characteristic features of *H. cornuta*, particularly the tall horn-like anterior petal-lobes. The latter specimen, however, on closer examination can be seen to be intermediate in some characters between the two concepts. In one flower examined one anterior petal-lobe was long and horn-like while the other was short and curved just as in *H. ruwenzoriensis*. Another flower had the petal-lobes of the latter species and the toothed lateral lobes of the labellum characteristic of many gatherings of *H. cornuta*.

There seems little doubt from the evidence available that the specimens referred to *H. ruwenzoriensis* Rendle are simply a series of abnormal forms of *H. cornuta* Lindl. in which the petals and labellum, always the most plastic portions of the orchid flower, have not developed properly, due apparently to incipient staminody of the organs concerned. It is interesting to note that such modifications are restricted to the northern part of the distribution of the species from Northern Nigeria to Kenya Colony.

***Satyrium volkensii* Schltr.** in Engl. Bot. Jahrb. **24**, 425 (1897).

S. leptopetalum Kraenzl. in Engl. Bot. Jahrb. **36**, 119 (1905).

S. dizygoceras Summerh. in Kew Bull. **1932**, 508.

Examination of type specimens and descriptions of the above species shows that they are conspecific. The species varies in the length of the spurs from a maximum of 24 mm. in a few specimens down to 12 mm. in others. I have, however, seen all intermediate lengths between these extremes and often different plants in the same gathering vary considerably in this respect. There is also no geographical segregation, long and short spurred specimens occurring throughout the range of the species.

The development of small additional spurs in front of the normal ones, which was the chief distinguishing character in the original diagnosis of *S. dizygoceras*, has been found to be quite inconstant. In some plants these spurs are well developed on every flower, in others they are only feebly developed, while in yet other specimens there is no sign of them. Here again specimens with additional spurs of varying sizes or without such spurs often occur together in the same gathering.

The type specimen of *S. leptopetalum* Kraenzl. is unfortunately destroyed but there is a gathering in the Kew Herbarium (Burt 1515) from the type locality which is clearly referable to the present species. The description of *S. leptopetalum* also agrees very well with the concept of *S. volkensii* as understood here.

The species is characterised in sect. *Chlorocorys* by the foliage leaves on separate sterile shoots, the labellum 4–5.5 mm. long laterally compressed with a narrow opening, the glabrous sepals and pubescent petals, the spurs usually rather incurved from the ovary and the merely tessellate-papillate ovary without projecting papillose outgrowths. The measurements of the labellum in the original description of *S. dizygoceras* (6–6.5 mm.) are shown by further examination to be incorrect.

As now understood the species occurs in Nigeria, Kenya Colony, Tanganyika (widely spread), Belgian Congo (Katanga), Northern and Southern Rhodesia. It is probable that the gaps in this distribution will be filled in the course of further botanical exploration.

Malaxis seychellarum (Kraenzl.) Summerhayes, comb. nov.

Liparis seychellarum Kraenzl. in Engl. Bot. Jahrb. **33**, 60 (1902).

Microstylis seychellarum (Kraenzl.) Schltr. in Beih. Bot. Centralbl. **33**, abt. 2, 411 (1915); Summerh. in Trans. Linn. Soc. Lond. ser. 2, **19**, Zool. 292 (1931).

In view of the modern recognition that *Malaxis* is the correct name for the genus concerned the above new combination is necessary. Other combinations which need making in the genus *Malaxis* are as follows:—

Malaxis atro-rubra (H. Perrier) Summerhayes, comb. nov.

Microstylis atro-ruber H. Perrier in Humbert, Not. Syst. **5**, 233 (1936).

Malaxis francoisii (H. Perrier) Summerhayes, comb. nov.

Microstylis francoisii H. Perrier, l.c. 234 (1936).

Malaxis madagascariensis (Klinge) Summerhayes, comb. nov.

Microstylis madagascariensis Klinge in Act. Hort. Petrop. **17**, i. 140, t. II, fig. 20–21 (1899).

Malaxis physuroides (Schltr.) Summerhayes, comb. nov.

Microstylis physuroides Schltr. in Ann. Mus. Col. Marseille, sér. iii, **1**, 164, t. VII, fig. B7–13 (1913).

Polystachya tayloriana Rendle in Journ. Linn. Soc. Lond. Bot. **30**, 385 (1895).

P. miranda Kraenzl. in Engl. Bot. Jahrb. **30**, 286 (1901).

P. busseana Kraenzl. l.c. **33**, 60 (1902).

P. holochila Schltr. in Warb. Kun.-Samb. Exped. 210 (1903).

P. kaessneriana Kraenzl. in Engl. Bot. Jahrb. **34**, 59 (1904).

P. macropetala Kraenzl. l.c. **36**, 117 (1905).

Examination of the type specimens of all the above supposed species, and of about 35 other gatherings, shows that they are referable to one widely ranging species. This species is characterised by the short conical pseudobulbs at the base of the flowering stem, bearing a number of leaves on the upper half but often leafless at the time of flowering, the tall slender flowering stem covered closely with stiff greyish sheaths, and the numerous very short lateral inflorescence-branches each producing a succession of rather long-stalked pinkish flowers of a thin consistency. The oblong-ovate, elliptical-ovate or almost quadrate labellum is quite entire with a short broad claw and rather obscure central hair-cushion. Kraenzlin uses the presence or absence of leaves at anthesis for distinguishing species but careful examination of many gatherings suggests that this is a climatic effect. Where the dry season is more prolonged or more complete the leaves dry up and fall off before flowering commences, whereas where there are several rainy periods the leaves are retained for a longer time.

An interesting feature of the species is its frequent occurrence as an epiphyte on *Vellozia*, but it is by no means confined to this habitat. In places it may occur on rocky outcrops, on loose stony eminences or on dry more or less bare soil. *P. zuluensis* L. Bolus, a native of Zululand and clearly closely allied to *P. tayloriana*, is also recorded as growing on *Vellozia* stems. It may be distinguished by the rhomboid nearly acute labellum and narrow curved petals, features which I have not seen in any Tropical African material. A gap of about 650 miles separates the Zululand locality from the nearest record for *P. tayloriana* at Mazoe in Southern Rhodesia.

P. tayloriana as here understood is distributed from Kenya southwards through Tanganyika to Nyasaland and Northern Rhodesia with single records from Southern Rhodesia and Portuguese East Africa. It also occurs in the Bas Congo, Kivu and Katanga regions of the Belgian Congo and in Angola.

Bulbophyllum graciliscapum *Summerhayes*, sp. nov. ; affine *B. miniato* Hort. ex F. W. Moore, a quo pseudobulbis minoribus, foliis brevioribus, inflorescentiis fere densifloris, bracteis plerumque internodios aequantibus vel superantibus, floribus verosimiliter succedaneis, labello longiore et angustiore purpureo- vel violaceo-piloso satis differt.

Herba verosimiliter epiphytica, floribus exceptis glabra ; rhizoma repens, leviter flexuosum, ramosum, teres, circiter 1 mm. diametro, sub pseudobulbis radices flexuosas ramosas graciles emittens. *Pseudobulbi* 1-3.5 cm. distantes, applanato-ovoidei vel biconvexi, 5-11 mm. longi, 3-7 mm. lati, siccitate minute rugulosi, apice monophylli. *Folia* breviter petiolata, elliptica vel oblongo-elliptica, apice rotundata vel levissime emarginata, petiolo incluso 1.3-2.5 cm. longa, 6-12 mm. lata, tenuiter coriacea ; petiolus gracilis, circiter 2 mm. longus. *Scapus* gracilis, leviter flexuosus, in toto 10-22 cm. longus ; pedunculus 9-18 cm. longus, vix 1 mm. diametro, vaginis 3-6 dissitis arctissimis 6-7 mm. longis instructus ; rhachis 1-4 cm. longa, angulata ; bracteae \pm cymbiformes, incurvatae, apice acuminatae, 4-5 mm. longae, scariosae. *Flores* plerumque 2-4 mm. distantes (duo infimi 5-12 mm. distantes), adscendentes, saturate violacei ;

pedicellus cum ovario 4-5 mm. longus. *Sepalum* intermedium lanceolatum, acutum, concavum, circiter 8 mm. longum et 2 mm. latum ; sepala lateralibus oblique lanceolata, acuta, 7.5 mm. longa, 1.75 mm. lata ; omnia sepala trinervia, marginibus involutis ciliatis. *Petala* linearia, basi curvata, superne subulato-incrassata, 4 mm. longa, 0.25 mm. lata, uninervia. *Labellum* e basi lata \pm bilobata lineare, in toto 5.5 mm. longum, inferne sectio \pm V-forme marginibus dense ciliatis, dimidio distali pilis numerosis usque ad 4.5 mm. longis purpureis vel violaceis dense indutum. *Columna* crassa, 1.3 mm. alta, steliis subulatis curvatis 1.4 mm. longis coronata ; pes incurvatus, columnam fere aequans ; anthera brevi-stipitata, hemisphaerica, antice in appendicem brevem acuminatam producta. *Capsula* immatura curvatim elongato-pyriformis, circiter 1 cm. longa et 2.5 mm. diametro.

GABON. Upper Ngounyé River, banks of the R. Ighamba near Kembélé, Nov. 1925, *Le Testu* 5787.

This rather graceful little plant is clearly a close relative of *B. miniatum* Hort. ex F. W. Moore from which it differs by the characters given in the diagnosis. The most obvious of these are the flowers certainly not opening all at once and probably only one at a time as in many other species of this affinity, and the dark purple hairs on the labellum.

Bulbophyllum pandanetorum *Summerhayes*, sp. nov. ; affine *B. bifario* Lindl., a quo foliis et scapis longioribus, bracteis latissime ovatis aequilatis quam longis, sepalis brevioribus minus acuminatis, petalis fere duplo longioribus, columna sub steliis haud dentata facile distinguitur.

Herba epiphytica, glaberrima ; rhizoma repens, circiter 2 mm. diametro, teres, primo cataphyllis scariosis vestitum, demum cicatricibus annulatis cataphyllorum delapsorum notatum, sub pseudobulbis radices graciles flexuosas ramosas pallide brunneas emittens. *Pseudobulbi* 2-5 cm. distantes, erecti, anguste vel conico-ellipsoidei, compresse 3-4-angulati, 2.4-5 cm. longi, 6-13 mm. lati, siccitate flavido-brunnei, nitidi, juventute cataphyllis duabus acutis dimidio vestiti, apice diphylli. *Folia* sessilia, lineari-ligulata vel lanceolato-linearibus, basi et apice leviter angustata, apice inaequaliter obtuse bilobulata apiculo interjecto, 6-17 cm. longa, 7-10 mm. lata, supra leviter longitudinaliter canaliculata, subtus nervo prominente. *Inflorescentia* erecta, rigida, 17-30 cm. alta, superne subdense 8-15-flora ; pedunculus leviter compressus, superne leviter fractiflexus, 12-21 cm. longus, circiter 2 mm. diametro, cataphyllis multis scariosis \pm imbricatis acutis 1.5-2 cm. longis fere omnino obiectus ; rhachis plurilata alis sub floribus \pm denticulatis, 5-9 cm. longa, 2.5 mm. diametro ; bractae erecto-patentes vel patentes, \pm cymbiformes, explanatae latissime ovatae, apice abrupte acuminatae, 8-13 mm. longae et latae, scariosae, flores fere aequantes vel superantes. *Flores* erecto-patentes, sessiles, rubri ; ovarium circiter 2-3 mm. longum. *Sepalum* intermedium incurvatum, convexum, triangulari-ovatum, breviter acuminatum, 4.5-5.5 mm. longum, 3-3.5 mm. latum ; sepala lateralibus oblique ovato-triangularia, acuminata, 5.75-7.25 mm. longa, circiter 4 mm. lata ; omnia sepala trinervia. *Petala* oblongo-elliptica vel subspathulata oblonga, apice rotundata, apiculata, 3.5 mm. longa,

1.5-2.25 mm. lata, secus medium crebre trinervia. *Labellum* carnosum, valde recurvatum, obscure trilobatum, lobis basalibus erectis rotundatis, lobo intermedio lingulato obtuso, totum 4 mm. longum, basi canaliculatum. *Columna* porrecta, semiteres, fere 2 mm. longa, antice anguste alata, alis integris, pede 2.6 mm. longo; androclinium satis excavatum, steliidiis triangularibus acutis; anthera galeata, filamento anguste triangulari.

GABON. Upper Ngounyé River, Wano River, between Kembélé and Mbigou, on *Pandanus*, Sept. 1925, *Le Testu* 5527 (type); R. Dèvèla, tributary of R. Ogoulou, on *Pandanus*, Sept. 1925, *Le Testu* 5547.

This rather striking species is most readily recognised by the very broad scarious bracts which are suddenly acuminate in the upper part. The bracts overtop the flowers at anthesis, but as the ovaries develop following fertilization the flowers become more or less exserted. The species, according to M. Le Testu's notes, always occurs epiphytic on *Pandanus* from which feature the specific epithet is derived.

B. pandanetorum is evidently allied to the West African *B. bifarium* Hook. f., which, however, has much narrower bracts of a rather stiffer texture and also differs in various minor floral features. Perhaps the most significant of these is the absence from the wings of the column below the steldia of the triangular tooth-like projection which occurs in *B. bifarium*.

Bulbophyllum prorepens *Summerhayes*, sp. nov.; affine *B. stolzii* Schltr., a quo pseudobulbis et foliis plus duplo longioribus, sepalis brevioribus latoribusque, petalis subacutis, columnae steliidiis brevioribus triangularibus satis differt.

Herba epiphytica, humilis, late repens, glaberrima; rhizoma elongatum, teres, gracile, 0.5-1 mm. diametro, sub pseudobulbis radices caespitosas flexuosas ramosas gracillimas pallide brunneas emittens. *Pseudobulbi* 2.5-12 cm. distantes, elongato-conici, saepe curvati, pluriangulati, siccitate valde rugosi, 1-3 cm. longi, 4-10 mm. diametro, ochracei, nitidi, apice diphylli. *Folia* lineari-ligulata, apice rotundata, brevissime bilobulata, basi breviter petiolata vel sub-sessilia, 3-6 cm. longa, 4-9 mm. lata, costa subtus prominula. *Inflorescentiae* simpliciter racemosae, folios fere duplo superantes, 6-14 cm. altae, superne 5-14-florae; pedunculus gracilis, 3-7 cm. longus, teres, fere 0.5 mm. diametro, basi vaginis scariosis inclusus, superne vaginis 2-3 dissitis acutis 4-9 mm. longis instructus; rhachis leviter fractiflexa, teres vel leviter angulata, 3-7 cm. longa; bractae patentes vel breviter reflexae, late lanceolatae, acutae, 3-4 mm. longae, ovarium pedicellatum superantes. *Flores* fere sessiles, erecto-patentes vel patentes, 2-7 mm. distantes, pallide virides; pedicellus cum ovario circiter 1 mm. longus. *Sepalum* intermedium late lanceolatum, acutum, fere 5 mm. longum, 2.5 mm. latum, inferne dorsaliter humiliterque carinatum; sepala lateraliter subpatentia, oblique lanceolata, acuta, 5 mm. longa, circiter 2 mm. lata, dorsale humiliter carinata; omnia sepala trinervia. *Petala* curvatim lanceolato-oblonga, subacuta, 2.25 mm. longa, fere 1 mm. lata, uninervia. *Labellum* infra medium geniculato-recurvatum, lanceolato-ligulatum, apice subacutum vel obtusum, 3.5 mm. longum, circiter 1 mm.

latum, basi callo centrali elongato instructum. *Columna* brevis, circiter 1.25 mm. longa, pede 2.3 mm. longo, stelidiis triangularibus 0.5 mm. longis.

BELGIAN CONGO. Albert National Park, Mt. Mikeno, south-west slope, 2100 m. alt., common locally on large trees, Dec. 1930, *Burt* 3152.

This graceful little species is characterised by the widely creeping habit, with the small pseudobulbs as much as 12 cm. apart, the specific epithet being derived from this feature. The species is clearly allied to *B. stolzii* Schltr., a native of southern Tanganyika Territory and Nyasaland, which is similar vegetatively but has much shorter pseudobulbs and leaves. There are also a number of minor floral differences, the most striking of which is in the stelidia of the column. In *B. stolzii* these are long and subulate whereas in the present species they are considerably shorter and broadly triangular.

Bulbophyllum verecundum *Summerhayes*, sp. nov. ; affine *B. coriscensi* Rchb. f. et *B. sangae* Schltr., ab utroque floribus dimidio minoribus, ab hoc petalis apice rotundatis papillosis differt.

Planta epiphytica, humilis, repens ; rhizoma gracile, fere teres, circiter 1 mm. diametro, sub pseudobulbis radices flexuosas \pm ramosas graciles pallide brunneas fere glabras emittens. *Pseudobulbi* 5-8 mm. distantes, ovoideo-subglobosi vel ovoidei, 3.5-5 mm. longi et diametro, siccitate rugosi, flavescentes, subnitentes, apice monophylli. *Folia* elliptica vel orbiculari-elliptica, basi breviter petiolata, apice rotundata \pm emarginata, 7-14 mm. longa, 6-10 mm. lata, tenuiter coriacea. *Scapus* folio duplo vel triplo longior, gracilis, 2-3.5 cm. altus, apice pauciflorus ; pedunculus 1.8-2.8 cm. longus, circiter 0.5 mm. diametro, teres, vaginis paucis arctis instructus ; rhachis brevis, 0.5-0.7 mm. longa ; bracteae lanceolatae, acutae, 1.5-2.5 mm. longae, scariosae. *Flores* circiter 3, erecto-patentes, de colore nil constat ; pedicellus cum ovario 2 mm. longus. *Sepalum* intermedium lanceolatum, apice acuminatum recurvatum, fere 4 mm. longum, circiter 1.5 mm. latum ; sepala lateralialia oblique triangulari-lanceolata, apice acuminata recurvata, basi cum pede columnae adnata, fere 4 mm. longa, circiter 1.75 mm. lata ; omnia sepala trinervia, intus superne dense papillato-puberula. *Petala* ligulato-oblonga, medio leviter angustata, apice rotundata, parte quarta apicali dense papillosa, 1.5 mm. longa, circiter 0.5 mm. lata, uninervia. *Labellum* valde recurvatum, carnosum, superne canaliculatum, circiter 1.2 mm. longum, marginibus basi ciliatis superne ciliolatis. *Columna* brevis, crassa, 0.7 mm. longa, pede 1 mm. longo, stelidiis leviter incurvatis subulato-linearibus 0.75 mm. longis.

GABON. Iméno, 24 miles S.E. of Mimongo, Nov. 3rd 1926, *Le Testu*.

This rather undistinguished species is clearly allied to *B. coriscense* Rchb. f. and *B. sangae* Schltr. but may be distinguished easily by the much smaller flowers. All three species have small more or less ovoid or subspherical pseudobulbs and short elliptical leaves ; they all occur in the same general region.

Bulbophyllum* (§ *Megaclinium*) *carnosilabium *Summerhayes*, sp. nov. ; a *B. lindleyi* (Rolle) Schltr. foliis longioribus latioribusque, rhachidibus pro rata angustioribus, pedicellis brevioribus, columna sub stelidiis

utrinque lobata, a *B. bufone* (Lindl.) Rchb. f. foliis pro rata longioribus, ab utroque sepalo intermedio apice acuminato intus nigro-lepidoto vel nigro-piloso, labello valde carnosø basi sectio V-formi antice ruguloso leviter curvato tantum satis differt.

Herba epiphytica fere omnino glabra ; rhizoma repens, 2-4 mm. diametro, vaginis scariosis omnino indutum, sub pseudobulbis radices numerosas ramosas flexuosas circiter 1 mm. diametro emittens. *Pseudobulbi* 1.5-2.5 cm. distantes, erecti, elongato-conici, ovoideo-conici vel conico-subcylindrici, \pm 3-angulati, angulis acutis, 3.5-7 cm. longi, 7-16 mm. lati, siccitate longitudinaliter rugulosi, flavido-virides, apice diphylli, inferne vaginis paucis scariosis obtusis per bulbum fere aequantibus omnino obtecti. *Folia* fere sessilia, oblanceolata, oblongo-oblanceolata, vel oblanceolato-ligulata, apice inaequaliter rotundato-vel obtuse brevissime bilobulata, basi leviter angustata, 10-21 cm. longa, supra medium 7-22 mm. lata, siccitate pallide griseo-viridia. *Scapus* e basi pseudobulbi exoriens, erectus, 15-35 cm. altus ; pedunculus 6-10 cm. longus, verosimiliter teres sed siccitate longitudinaliter plurisulcatus, circiter 1 mm. diametro, vaginis 4-6 subaxis obtusis scariosis 5-9 mm. longis instructus ; rhachis applanata, linearis vel lineari-ligulata, utroque sensim angustata, 9-25 cm. longa, 2-7 mm. lata ; bracteae e rhachidis linea mediana exorientes, 6-10 mm. distantes (uno latere 12-20 mm. distantes), triangulari-lanceolatae, acutae, 2-6 mm. longae, 1-1.5 mm. latae, sub anthesi reflexae. *Flores* patentes, rubescentes ; pedicellus cum ovario 2-2.5 mm. longus. *Sepalum* intermedium erectum vel leviter incurvatum, e basi latiuscula late oblanceolatum, apice acuminatum, 5.5-6.8 mm. longum, 2.5-3.3 mm. latum, concavum, marginibus superne incrassatis \pm involutis, intus nigro-lepidotum vel pilis nigris flocculentibus instructum, subquinenervium ; sepala lateralialia valde oblique quadrato-ovata, apice acuminata, superne valde reflexa, 4.5-6.75 mm. longa, basi 4 mm. lata, trinervia, basi cum pede columnae adnata mentum obtusum 2.5-3 mm. longum formantia. *Petala* erecta, inferne cum columna adnata, oblonga vel lanceolato-oblonga, subacuta, 1.5-2 mm. longa, 0.4-0.9 mm. lata, uninervia. *Labellum* valde carnosum, fere rectum, lateraliter compressum, 3-3.7 mm. longum, basi \pm bilobatum sectio V-forme, superne leviter canaliculatum, supra valde corrugatum, apice subacutum. *Columna* leviter incurvata, 2-2.5 mm. alta, semi-teres, stelidiis brevibus oblongis truncatis vel obtusis, alis columnae sub stelidiis utrinque lobo rotundato instructis. *Capsulae* immaturae anguste obconico-cylindricae, usque ad 12 mm. longae.

GABON. Upper Ngounyé R., Wina rapid on R. Louetoyé near Makouti, S. of Mbigou, 5 April 1927, *Le Testu* 6473 (type) ; Moucighé, N. of Kembélé, 16 April 1926, *Le Testu* 5929 ; between Boudyanguila and Noumbo, S.E. of Kembélé, 22 Sept. 1925, *Le Testu* 5515 ; Mbigou, rapid on R. Mboumi, 18 Nov. 1925, *Le Testu* 5727.

The species here described resembles in general vegetative and inflorescence features many other species in the section *Megaclinium*. It may be distinguished from all others which I have seen, except *B. colubrinum* (Rchb. f.) Rchb. f., by the almost straight, laterally compressed, very fleshy labellum, in allusion to which the specific epithet has been given. *B. colubrinum* differs in having 1-leaved pseudobulbs, a narrowly lanceo-

late caudate-acuminata intermediate sepal, the lower part of the labellum denticulate along the keels, and broad rounded wings to the column below the stelidia.

Bulbophyllum (§ **Megaclinium**) **cercoglossum** *Summerhayes*, sp. nov. ; species distinctissima, pseudobulbis anguste cylindraceis, inflorescentiae rhachidibus foliaceis latissimis sed pro rata brevibus, labello apice acuminato-caudato marginibus denticulatis facile distinguenda.

Herba epiphytica, usque ad 30 cm. alta, glaberrima ; rhizoma repens, pauciramosum, teres, 3-4 mm. diametro, vaginis numerosis fere truncatis vel acutis 7-15 mm. longis fere omnino obtectum, sub pseudobulbis radices flexuosas ramosas griseas emittens. *Pseudobulbi* 5-12 cm. distantes, erecti, anguste conico-cylindracei vel cylindracei, saepius sursum sensim angustati, 6-10.5 cm. longi, inferne 2.5-9 mm. diametro, siccitate longitudinaliter rugosi, flavidi, inferne cataphyllis paucis atrobrunneis scariosis acutis usque ad 6 cm. longis vestiti, apice diphylli. *Folia* \pm divergentia, oblanceolata vel elliptico-oblanceolata, apice acuta minute tridentata, basi brevissime petiolata vel subsessilia, 8-15 cm. longa, 2-4.5 cm. lata, tenuiter coriacea, costa supra leviter canaliculata subtus prominula. *Inflorescentiae* singulae vel saepius geminae, inferne erectae, superne \pm curvatae, folios superantes ; pedunculus pro rata gracilis, verosimiliter teres, 11-28 cm. longus, 1-2 mm. diametro, vaginis 7-13 subarctis acutis 5-10 mm. longis scariosis instructus ; rhachis valde expansa, foliacea, oblonga vel elliptica, siccitate chartacea, valde excentrica, \pm curvata, marginibus subcrenatis, 8-14 cm. longa, 2.8-5 cm. lata ; bractae valde reflexae, minutae, triangulares, marginibus inflexis, acuminatae, 1-3 mm. longae. *Flores* 4-8 mm. distantes, flavi, \pm patentes ; pedicellus cum ovario 4-6 mm. longus, gracilis. *Sepalum* intermedium erectum, parte apicali valde reflexum, lineari-lanceolatum, caudato-acuminatum, 9-10 mm. longum, circiter 1.5 mm. latum ; sepala lateralia cum pede columnae adnata mentum rotundatum 2.5 mm. longum formantia, transverse oblique elliptica, apice caudato-acuminata reflexa, in toto circiter 5.5 mm. longa et lata, acumine circiter 1.75 mm. longo ; omnia sepala trinervia. *Petala* valde falcata, lanceolato-lineariter, acuminata, circiter 5.5 mm. longa, 0.6-0.8 mm. lata, uninervia. *Labellum* recurvatum, e basi carnosa angusta elliptico-ovatum, apice caudato-acuminatum valde reflexum, marginibus denticulatis, cauda 2.5 mm. longa exclusa 4.5 mm. longum, 4 mm. latum, secus medium trinervium. *Columna* erecta, lata, 1.5 mm. alta, pede valde incurvato 5.5 mm. longo, androclinio leviter excavato, stelidiis late falcatis recurvatis circiter 2 mm. longis ; anthera hemisphaerica, antice in appendicem apice breviter tridenticulatam producta ; fovea stigmatica verosimiliter quadrata.

GABON. Upper Ngounyé River, old village of Bagni, Nov. 1925, *Le Testu* 5772.

This is one of the most remarkable members of the section *Megaclinium* which I have seen. In its long slender cylindrical pseudobulbs it resembles *B. longibulbus* Schltr. but differs markedly from that species in the much shorter and broader rhachis and in the floral structure. The long slender peduncle, which is furnished with a number of more or less equidistant short scarious sheaths, terminates in a very broad flattened

rhachis which in shape and size is remarkably similar to the foliage leaves. Compared with all other *Megacliniums* which I have seen the rhachis is very broad compared with its length, the length being only about 3 times the breadth.

The structure of the flowers is also remarkable in several ways. All the perianth segments terminate in tail-like apices, but although this is true of some other species as regards the sepals and petals, I do not know of any species in which the *labellum* has a tail-like acumen. The specific epithet is given in allusion to this feature. Otherwise the lip is very similar in shape and consistency to that of many other species, a notable feature, however, being the denticulate margin, since this is usually either quite entire or longly pectinately divided in the lower part. Finally the stelidia are remarkable in being broad sickle-shaped structures which recurve more or less over the androclinium on each side of the anther.

Altogether *B. cercoglossum* is a species which appears to have no near relatives and which can be separated easily from other members of the section on both vegetative and floral characters.

Eulophia calantha Schltr. in Warb. Kun.-Samb. Exped. 215 (1903).
Lissochilus kapandensis De Wildem. in Bull. Jard. Bot. Brux. **6**, 90, t. XIII, fig. 1-5 (1919).

Comparison of duplicates of the type specimens (*Baum* 631 and *Homblé* 973), descriptions and illustrations of the above two concepts, together with numerous other gatherings from a wide area in eastern Africa, shows that they are conspecific. The species belongs to a large group which is intermediate in characters between the concepts of the two genera *Eulophia* and *Lissochilus*.

Eulophia cucullata (Sw.) Steud. Nom. Bot. ed. 2, **1**, 605 (1840).

Lissochilus kassnerianus Kraenzl. in Engl. Bot. Jahrb. **51**, 391 (1914).

Examination of the type collection (*Kassner* 2105) of Kraenzlin's species shows that it is conspecific with the wellknown *Eulophia cucullata*, which has been found in many other localities in Northern Rhodesia and the Katanga Province of the Belgian Congo.

Eulophia flavopurpurea (Rchb. f.) Rolfe in Dyer, Fl. Trop. Afr. **7**, 65 (1897).

Lissochilus corbisieri De Wildem. in Bull. Jard. Bot. Brux. **6**, 80, t. XV, fig. 5-9 (1919).

Examination of the description and illustrations of *Lissochilus corbisieri* De Wildem. shows clearly that this is conspecific with the widely ranging *Eulophia flavopurpurea* (Rchb. f.) Rolfe. The flowers in the Corbisier specimen are evidently smaller than the average of the species but otherwise agree in all features.

Eulophia huttonii Rolfe in Dyer, Fl. Cap. **5**, iii. 52 (1912).

[*E. oliveriana* (non (Rchb. f.) Bolus)—Bolus, Ic. Orch. Austr.-Afr. **2**, t. 10 (1911)].

In my last contribution in this series (*Kew Bull.* **1953**, 147) I pointed out that the plant figured by Bolus as *Eulophia oliveriana* did not agree with

the type specimen. I have now investigated this matter further and it is clear that the plant in question is identical with Rolfe's *Eulophia huttonii*. Several of the gatherings cited by Bolus (notably Wood 4202 and 4259) are also cited by Rolfe under *E. huttonii* while the description of *E. huttonii* agrees very well with Bolus's plate.

Eulophia paivaeana (Rchb. f.) Summerh. in Kew Bull. 1953, 151.

Lissochilus morrumbalaensis De Wildem. in Pl. Nov. Hort. Then. 1, 61, t. XV (1904).

Examination of the description and excellent figure of De Wildeman's species shows without doubt that it is conspecific with the widely ranging *E. paivaeana*, in which it is referable to the typical sub-species *paivaeana*.

Eulophia paivaeana (Rchb. f.) Summerh., subsp. ***borealis*** Summerh. in Kew Bull. 1953, 152.

Lissochilus renschianus Rchb. f. Otia Bot. Hamburg. 75 (1881).

Examination of the type specimen (Mecho 138) of *L. renschianus* Rchb. f. in the Reichenbach herbarium shows clearly that it is identical with the northern subspecies of *Eulophia paivaeana* (Rchb. f.) Summerh. It is interesting to note that of the material so far seen from Angola that from the more southerly regions (Huilla) belongs to the typical or southern subspecies, whereas the gathering from Pungo Andongo in the north is referable to subsp. *borealis*. Whether further collections will confirm these distributions yet remains to be seen.

The determination of this gathering considerably extends the known distribution of subsp. *borealis* which previously was not known farther west than the area of the Parc National Albert.

Eulophia walleri (Rchb. f.) Kraenzl. apud Gilg in Engl. Pflanzenw. Ost.-Afr. C, 157 (1895).

Cyrtopera walleri Rchb. f. Otia Bot. Hamburg. 117 (1881).

Eulophia angustiflora Kraenzl. in Engl. Bot. Jahrb. 43, 396 (1909).

? *E. piscicelliana* Busc. & Schltr. apud Busc. & Muschl. in Engl. Bot. Jahrb. 49, 463 (1913).

On examining the type specimen of *E. angustiflora* Kraenzl. I cannot see how it differs from the wellknown *E. walleri* (Rchb. f.) Kraenzl. It is perhaps significant that in the original description of *E. angustiflora* Kraenzlin makes no reference to *E. walleri* but states that his species is allied to *E. aurantiaca* Rolfe.

The question of *E. piscicelliana* is more puzzling. I have not seen any authentic material of this species but only a photograph of a drawing of the species which was apparently intended for publication. This drawing agrees very closely with the original description and the two together picture a plant extremely similar to *E. walleri* in vegetative characters and in the inflorescence. The tepals are a little longer than in any flowers of *E. walleri* which I have seen but are otherwise similar. The basal part of the labellum also agrees with that of *E. walleri* but the middle lobe is only a little longer than the laterals and bears no hairlike outgrowths. In view of the close similarity of the species to *E. walleri* and the fact that the locality where it was found is well within the dis-

tribution of that species, it seems possible that *E. piscicelliana* was based on a specimen of *E. walleri* in which the flowers were past their best and in which the labellum had partly withered. It is an easily observed fact that in many orchids the labellum withers first and is often quite withered when the other perianth members are still more or less fresh. It is desirable that more material should be collected from the Bwana Mkubwa district of Northern Rhodesia to see what species of this affinity do really grow there.

Eulophia welwitschii (Rchb. f.) Rolfe in Bol. Soc. Brot. **7**, 236 (1889).

Orthochilus welwitschii Rchb. f. in Flora, **48**, 186 (1865).

O. renschianus Rchb. f. in Flora, **65**, 532 (1882).

Eulophia renschiana (Rchb. f.) Dur. & Schinz, Consp. Fl. Afr. **5**, 25 (1895).

Comparison of the type gatherings (*Welwitsch* 720 and *Mechow* 299) of the above two concepts shows that they are conspecific. Rolfe's key distinction in the Flora of Tropical Africa (**7**, p. 49) is quite misleading since *both* species have the lip 2-keeled at the base. In all respects the two gatherings agree very well and it is difficult to see why Reichenbach described the second species at all ; it is interesting to note that in his description of *Orthochilus renschianus* he makes no reference to his earlier species.

The species is common in Angola while I have seen specimens also from the southern Belgian Congo and from Northern Rhodesia.

Angraecum* (§ *Pectinaria*) *gabonense Summerhayes, sp. nov. ; affine *A. pungenti* Schltr., a quo habitu graciliore, foliis fere dimidio minoribus, floribus paulo minoribus, calcar pro rata brevius sed magis inflato satis differt.

Herba epiphytica, verosimiliter \pm dependens, radicibus exceptis omnino glabra. Caules caespitosi, graciles, multiramosi, \pm dependentes dimidio apicali \pm adscendentes, e basi et nodis radicanes, usque ad ultra 35 cm. longi, 1-1.5 mm. diametro, superne multifoliati, inferne vaginis foliorum delapsorum fere omnino vestiti ; radices graciles, \pm ramosae, glabrae vel minute puberulae, 0.5-1 mm. diametro. Folia disticha, a cauli paulo divergentia vel incurvata ; vagina arcta, pluricostulata, rugulosa, 3-6 mm. longa ; lamina \pm incurvata vel recurvata, lineari-lanceolata, lanceolato-ligulata vel oblongo-lanceolata, infra apicem quasi articulata apice ipso subulato-acuminata, 1-2 cm. longa, 2-3.7 mm. lata, marginibus \pm recurvatis vel revolutis, siccitate quasi teres vel semi-teres, carnosae, nitidae. Inflorescentia brevissima, uniflora, basi cataphyllis arcte imbricantibus oblecta. Flores patentes, albi ; pedicellus cum ovario 4.5 mm. longus. Sepalum intermedium ligulato-oblancheolatum, apice subacutum, circiter 6 mm. longum et 1.75 mm. latum ; sepala lateralia oblique oblancheolato-ligulata, apice subacuta, 6-6.5 mm. longa, 1.5-1.75 mm. lata ; omnia sepala subquinenervia. Petala oblique spathulatim oblancheolata, apice obtusa, 5.5-6 mm. longa, circiter 1.75 mm. lata, subquinenervia ; omnia tepala semi-patentia vel subconniventia. Labellum valde concavum, orbiculari-ovatum, apice apiculato-acuminatum, 3.5-3.75 mm. longum, explanatum fere 5 mm. latum, plurinervium ; calcar fere rectum vel leviter incurvatum, ex ore lato valde angustatum deinde dimidio apicali inflatum obtusissi-

mm, 2.5–3.5 mm. longum. *Columna brevis*, truncata, circiter 1.75 mm. longa; androclinium leviter excavatum; anthera hemisphaerica, postice carinata, antice in appendicem acutam producta; pollinia pyriformia, basi in pseudo-caudiculam decurrentia, in toto 0.6 mm. longa; stipites nulli; viscidium ambitu oblongum, antice rotundatum, postice bifidum, lobis leviter divergentibus, in toto 0.85 mm. longum; rostellum productum, bifidum, lobis quadratis apice truncatis.

GABON. Upper Ngounyé River, Nimalaba, N.E. of Les Echiras, Feb. 1927, *Le Testu* 6384 (type); Forêt des Echiras, between Zambi and Guidouma, Nov. 1924 (fruit), *Le Testu* 5128; environs of Ounzenzi, W. of Mimongo, Feb. 1925, *Le Testu* 5239.

This is a delightful little species of sect. *Pectinaria*, clearly allied to *A. pungens* Schltr. and *A. doratophyllum* Summerh., but smaller and more delicate in its vegetative parts. The flowers also are smaller with a much swollen short spur. The leaves show the curious false articulation near the apex found also in *A. pungens* as well as in several species of *Sarcanthus*, but the feature is not so prominent in the present species.

Encheiridion leptostele Summerhayes, sp. nov.; ab *E. macrorrhynchio* (Schltr.) Summerh. floribus paulo majoribus, sepalo intermedio minus convexo, sepalis lateralibus et petalis pro rata angustioribus minus obliquis, labello ambitu ovato-oblongo apiculato-acuto lateribus integris vel sparse dentatis, columna triplo longiore gracili, rostellum e columnae parte basali exoriente, viscidio stipite fere aequilongo facile distinguendum.

Herba epiphytica, aphylla; caulis saepius brevissimus, sed rarius usque ad 2 cm. longus, inferne radices numerosas flexuosas griseas pauciramosas 1–3 mm. diametro emittens, apice cataphyllis scariosis acutis imbricatis vestitus. *Inflorescentiae* verosimiliter dependentes, simpliciter racemosae, usque ad 5 cm. longae, 4–7-florae; bractae ochraceae, subacutae, 1–2 mm. longae, ovario pedicellato multo breviores. *Flores* 3–5 mm. distantes, patentes, albi, subhyalini; pedicellus (cum ovario) gracilis, 4–6 mm. longus. *Sepalum* intermedium erectum, convexum, columna \pm amplexans, late obovato-oblongum, subacutum, 7–8.5 mm. longum, 5–6.5 mm. latum, quinque- vel subseptemnervium; sepala lateralia patentia vel \pm deflexa, oblonga vel oblanceolata-oblonga, apice acuta, prope basin leviter curvata, circiter 8.5 mm. longa et 3 mm. lata, tri- vel subquinquenervia. *Petala* patentia, lanceolato-ovata vel oblonga, apice obtusa vel subacuta, 5.5–7.5 mm. longa, 2.5–3.75 mm. lata, tri- vel subquinquenervia. *Labellum* calcaratum ore calcaris lobis (si mavis lobis lateralibus labelli) triangulari-rotundatis instructo; lamina ex ungue brevi ovato-oblonga, apice apiculato-acuta vel obscure trilobulata, 5.5–7 mm. longa, 2.5–5 mm. lata, marginibus integris vel superne sparse dentatis, quinquenervis; calcar ex ore lato sursum angustatum, parte quarta apicali valde incurvatum, apice valde inflatum, in toto 9–13 mm. longum, ore 1.5–2.5 mm. diametro, parte apicali 1.5–2 mm. diametro. *Columna* erecta, superne semi-teres, 3.5–6 mm. longa, androclinio leviter excavato reclinato-adscendente; anthera hemisphaerica, antice in appendice acutissima columna parallela apice recurvata 3 mm. longa producta; pollinia ovoidea, fere 1 mm. longa, stipite 4–6 mm. longo infra medium geniculato anguste lineari apice dilatato reflexo, viscidio lineari-ligulato utroque leviter angustato 3.5–

5.5 mm. longo subhyalino ; rostellum e columnae parte basali exoriens, sursum porrectum, ensiformi-lineare, 3.5-6.5 mm. longum ; fovea stigmatica oblonga.

FRENCH CONGO. Boukoko, near Mbaiki, on branches of diseased Coffee plants, March 1949, *Mouton in Herb. Tisserant* 1389 (type) ; same locality, on small undergrowth trees, March 1948, *Equipe in Herb. Tisserant* 816 (both Herb. Le Testu).

BELGIAN CONGO. Epulu, on route from Penghe to Irumu, in primary forest of R. Ituri, in crown of tree, Feb. 1914, *Bequaert* 2599 (Herb. Brussels).

This interesting plant is clearly referable to the genus *Encheiridion* with which it agrees closely in vegetative and general floral characters, especially the fundamental structure of the labellum. It differs from *E. macrorrhynchium* (Schltr.) Summerh., the other species of this hitherto monotypic genus, in the details of the floral parts, and particularly in the column. In *E. macrorrhynchium* this is short and stout with the long sword-shaped rostellum arising from its apex just below the androclinium. In the present species, however, the column is long, and slender in the upper part, the rostellum, almost identical in shape with that in the other species, arising from the base of the slender portion. Associated differences are the long appendage to the anther, designed to cover part of the stipes of the pollinium, and the much longer stipes, which is bent in the middle at the point of juncture of the column and rostellum. The viscidium is also much larger in *E. leptostele* but the pollinarium in general structure agrees well with that in *E. macrorrhynchium*.

Aërangis stelligera *Summerhayes*, sp. nov. ; affinis *A. megaphyllae* Summerh., a qua foliis fere duplo minoribus, floribus majoribus, labelli calcaribus plus duplo longioribus, columna satis longiore distinguitur.

Herba epiphytica 15-20 cm. alta, horizontalia vel \pm pendula, omnino glabra. *Caulis* brevis, 1-3 cm. longus, radices numerosas flexuosas ramosas 2-3 mm. diametro emittens, 4-5-phyllus, vaginis foliorum omnino vestitus. *Folia* disticha, \pm patentia ; vagina sublaxa, prominenter multicostulata, circiter 1 cm. longa ; lamina oblanceolata vel oblongo-oblanceolata, leviter curvata, apice valde inaequaliter acute bilobulata, lobulo longiore 5-10 mm. longo, 7-15 cm. longa, 1.5-4 cm. lata, textura tenuiter coriacea, siccitate venarum reticulatione distincto. *Inflorescentia* pendula, simpliciter racemosa, 10-25 cm. longa, laxe 3-6-flora ; pedunculus gracilis, 5-10 cm. longus, 1-2 mm. diametro, vaginis paucis subarctis subacutis 6-12 mm. longis instructus ; rhachis gracilis, leviter fractiflexa, teres ; bracteae patentibus, breviter ochreateae, ovatae, subacutae vel obtusae, 5-10 mm. longae, ovario pedicellato multo breviores. *Flores* 2-4 cm. distantes, subpatentes, stellati, albi ; pedicellus cum ovario 3-6 cm. longus. *Sepalum* intermedium caudato-lanceolatum, medio subito angustatum, 4-5 cm. longum, inferne 7 mm. latum ; sepala lateralibus leviter oblique acuminato-lanceolata, 4.5-5.5 cm. longa, 4-5.5 mm. lata ; omnia sepala septemnervia. *Petala* anguste lanceolata, acutissima, 3.75-4 cm. longa, 4-5 mm. lata, 5-7-nervia ; omnia tepala patentia vel leviter reflexa. *Labellum* tepalis simile, anguste lanceolatum, fere caudato-acuminatum, circiter 4 cm. longum, 4.5-5 mm. latum, 11-nervium ; calcar filiformi-cylindricum, triente apicali modice

inflatum, circiter 23 cm. longum, infra apicem 2.5 mm. diametro. *Columna* erecta, 10–12.5 mm. alta, dimidio inferiore teres, superne modice dilatata; anthera hemisphaerica, antice breviter producta, triangularis; androclinium inclinatum, satis excavatum; pollinia ellipsoidea, fere 2 mm. longa; rostellum deflexim productum, lineare; fovea stigmatica oblonga, labio inferiore prominente.

FRENCH CONGO. Boukoko, near Mbaiki, in forest. Oct. 1947, *Tisserant* 360 type in Herb. Le Testu; Oct. 1949, *Tisserant* 1615. Vern. name:—Molo-ngege.

BELGIAN CONGO. Uele, Nala, 1911, *Boone* 106.

The species here described is notable for possessing the largest flowers in the genus *Aérangis*. It is clearly related to *A. megaphylla* Summerh. from the island of Annobon, but differs in the characters given in the diagnosis. The species is also interesting for the long column, over 1 cm. in length, in which respect it approaches the monotypic genus *Barombia*. In fact it seems probable that this latter is really only a species of *Aérangis* with an exceptionally long column almost equalling the tepals in length. Further exploration may reveal the occurrence of species which will bridge the present gap between these two genera.

Ancistrorhynchus tenuicaulis *Summerhayes*, sp. nov.; ab *A. parviflora* Summerh. cauli graciliore, foliis angustioribus superne angustatis, floribus paulo majoribus, ab *A. straussii* Schltr., Schltr. cauli elongato, foliis brevioribus, floribus majoribus satis differt.

Herba epiphytica; caulis elongatus, = ramosus, pendens superne arcuatim adscendens, prope apicem subdense foliatus, inferne vaginis foliorum delapsorum vestitus, usque ad 16 cm. longus, circiter 2 mm. diametro, inferne radices numerosas pauciramosas flexuosas griseas emittens. *Folia* disticha, patentia vel = recurvata; lamina lineari-ligulata vel ligulata, apice angustata inaequaliter acute vel subacute bilobulata, sectio = V-formis, tenuiter coriacea, 2–7 cm. longa, 2–6 mm. lata; vagina longitudinaliter rugulosa. *Inflorescentiae* brevissimae, subcapitatae, ex axillis foliorum infimorum vel vaginorum foliorum delapsorum exorientes, usque ad 7–8-florae; bracteae pro genere minores, pedicellis cum ovariis aequilongae vel paulo superantes, late ovatae vel oblongo-ovatae, apice rotundatae = cucullatae, usque ad 3.5 mm. longae et 2.5 mm. latae, uninerviae, subhyalinae. *Flores* adscendentes, albi; pedicellus cum ovario circiter 3 mm. longus. *Sepalum* intermedium anguste vel ligulato-oblongum, apice obtusum vel rotundatum, 2.5–3.5 mm. longum, 1–1.5 mm. latum; sepala lateraliter oblique ligulato-oblonga, apice obtusa, 2.75–3.5 mm. longa, 1–1.5 mm. lata. *Petala* oblique elliptico-oblonga vel elliptico-ligulata, apice rotundata, 2.5–3 mm. longa, 0.75–1.4 mm. lata; omnia tepala trinervia, subhyalina. *Labellum* valde concavum, late ovatum vel orbiculari-ovatum, indistincte trilobatum, apice rotundatum = cucullatum, 1.75–2.5 mm. longum, 1.75–3 mm. latum, septem- vel subseptemnervium; calcar ex ore angusto ellipsoideo-inflatum, apice rotundatum, 1.75–2.25 mm. longum, 1.25–2.25 mm. diametro. *Columna* erecta, brevis, crassa, circiter 0.8 mm. longa; androclinium reclinatam, leviter excavatum; anthera subhemisphaerica, antice paulo producta; pollinia ovoidea, circiter 0.25 mm. longa, stipitibus duobus superne subspathulatis dilatatis 0.3 mm.

longis, viscidio ligulato utroque angustato parte quarta apicali subito recurvato circiter 0.75 mm. longo; rostellum deorsum productum, ligulatum, parte quarta apicali valde recurvatum, circiter 0.75 mm. longum, viscidio amoto ad basin bipartitum; fovea stigmatica orbicularis vel quadrato-orbicularis. *Capulae* late fusiformes, 5-6 mm. longae, circiter 2 mm. diametro, longitudinaliter pluricostatae.

BELGIAN CONGO. Inuri River, between Penghe and Irumu, Kampia na bulongo, in primary forest, in fruit Feb. 1914, *Begueri* 2656; Parc National Albert, between Nyamagira and Nyaseke, 1786 m. alt., in montane forest, in semi-shade, May 1945, *Germann* 3818.

UGANDA. Bunyoro, Buzoma Forest, on small tree overhanging stream, rare, June 1944, *Eggeling* 5536; Kigezi, Ishasha Gorge, 1200 m. alt., in forest, April 1946, *Purseglove* 2934 type; same locality, 1130 m. alt., in forest, May 1950, *Purseglove* 3445.

This small-flowered species is evidently allied to *A. parviflora* Summerh., from Tanganyika, *A. strausii* Schltr., Schltr. and *A. rotundifolia* Kraenzl., Summerh., the two latter from west and central Africa. It has a much elongated stem and this separates it easily from *A. strausii*. From the other two species it differs in the shape and size of the leaves and in the floral details. The species appears to be widely spread in the forests of the eastern Belgian Congo and in western Uganda.

The gender of *Theobroma*.—In recent years some doubt and confusion have arisen as to whether the name of the genus *Theobroma* L., derived from the Greek *θεός*, 'god', and *βοδῖα*, 'food', should be treated as neuter or feminine in gender, and there are, in fact, two Greek words, *τὸ βοδῖα* 3rd declension, neuter and *ἡ βοδῖα* 1st declension, feminine, both meaning 'food'. Transcribed into Latin, *βοδῖα* would become *broma*, genitive *bromatis*, 3rd declension and neuter, while *βοδῖα* would become *broma*, genitive *bromae*, 1st declension and feminine. Therefore *Theobroma subincana* Mart. and *T. speciosum* Willd. would be correct if the feminine *broma* was originally intended, *T. subincanum* and *T. speciosum* if the neuter word was meant. Hence, presumably, the prevailing confusion.

But *Theobroma* is a Linnean genus and, in addition to *Theobroma cacao* L., there is another Linnean binomial in the genus, *Theobroma augusta* L. Syst. ed. 12, 3, p. 233, which appears to be the key to the problem. By writing *augusta* for this species Linnaeus has indicated that he intended the compound word providing the name of his genus, *Theobroma*, to be feminine, and therefore feminine it must stay.

THE PROPAGATION OF *HEVEA BRASILIENSIS* FROM CUTTINGS.

L. STENNING and G. EVANS.

The Plant Quarantine Station at Kew was opened some years ago to check the spread of diseases and pests which have resulted in the past from the indiscriminate introduction of economic plants from one country to another. The main crops handled at present are cocoa, rubber and bananas. All these are tropical plants and their cultivation under glass at Kew presents special problems, and plants have to be propagated for at least one generation under glass before they can be forwarded to their final destinations.

The literature available indicated that the rooting of *Hevea* cuttings had proved exceedingly intractable in the tropics, as is the case with many other latex bearing plants. In spite of this it was felt that this method must be tried as it seemed the only way to meet our purpose.

The first trials were made early in October, 1952. Young leading shoots rather thicker than a lead pencil were cut just behind a node and about 6" long. Alternatively, side shoots with a heel were tried. In both, the top leaves were allowed to remain on the cutting. Each cutting had the end sealed immediately by dipping in powdered charcoal to prevent loss of latex.

Six-inch pots are filled half-way with a mixture of silver sand and loam, with a little peat. The top half of the pot is then filled with sharp sand of the type customarily used for rooting cuttings at Kew. A small pot is inverted over the 6" pot and also filled with sand. The cutting is then inserted through the draining hole into the sand below until it nears the rooting mixture at the bottom. The whole is kept well watered, and this helps to solidify the sand round the base of the stem. No hormones were used. Rooting usually takes place in eight to ten weeks. When the roots have occupied the lower pot, the top pot is cracked and removed, and the rooted cutting is then tapped out of the lower pot and transplanted without disturbing the roots. The pots containing the cuttings were placed in a propagating frame with bottom heat from hot water pipes below. The temperature inside the frame was kept at about 85°F. to 90°F., and the humidity around 80°F.

The rooting experiments continued from the middle of October to early March and then ceased because the frames were no longer available. During this period thirty-five cuttings have been successfully rooted and are now growing at Kew. The majority of these are from special clones of *H. brasiliensis*, but cuttings from *H. spruceana* and *H. benthamiana* have also been established on their own roots.

The comparative ease with which *Hevea* cuttings can be rooted at Kew is a matter of interest, and the reasons why this is so are being further investigated.

A somewhat fuller note on this work, with illustrations, will, it is expected, be published in the Journal of the Rubber Research Institute very shortly.

Flora of Western Australia.*—Everyone with an interest in the Australian flora and in grasses in particular will welcome this—the first—and undoubtedly the most important volume of the Flora of Western Australia. On its preparation Mr. Gardner has laboured unceasingly for very many years, first in building up the basic material in the Perth Herbarium as a result of his extensive field studies in all parts of the State, then in classifying and naming the vast amount of material gathered together which incidentally entailed visits to Kew and other overseas herbaria, and finally in drawing up the very detailed descriptive text and making the fine series of line illustrations. For this carefully prepared and indispensable work, as well as for his numerous other services to botany, agriculture, forestry and horticulture in Australia, Mr. Gardner well deserves the gratitude of his fellow countrymen.

The Flora opens with a brief account of Western Australian grasslands, followed by keys to the tribes and genera, leading on to the bulk of the work which comprises descriptions of genera and species together with notes on their distribution. It concludes with an index, glossary and addenda. The classification adopted is mainly that of Hackel as modified by Hitchcock, with some additions, such as the acceptance of the tribes *Pappophoreae* and *Sporoboleae*, and the division of the *Paniceae* and *Andropogoneae* into the smaller genera as defined by Stapf and others. It is thus based mainly on gross morphology, and does not take into consideration the important evidence of relationships derived from anatomical, chemical and cytological studies. For this reason the *Eragrostae* and *Danthonieae* are merged in the *Festuceae*, *Monerma*, *Parapholis* and *Lolium* are returned to the *Hordeae*, and *Astrebula* is included in the *Chlorideae*.

The grass-flora consists of about 128 genera and 420 indigenous and naturalized species. Of these approximately 40 genera and 120 species have been introduced into the State during the past 150 years. Many of the exotic species are annuals, largely from the Mediterranean Region, or from parts of South Africa and North and South America with similar climatic conditions. A large proportion of the perennial introductions are temperate or tropical fodder plants which have become established in favourable districts, or they are grasses planted for special purposes, such as *Ammophila arenaria* and *Ehrharta villosa* for the consolidation of sand-dunes. The native grass-flora is comparatively poor considering the size of the state. The greatest number of species, including many *Andropogoneae* and *Paniceae*, is found in the tropical Northern Province. Here with a fairly reliable summer rainfall, the grasses either form a continuous cover to the total exclusion of other plants, or comprise the principal ground flora in various other types of vegetation. On the other hand, the South-West Province which receives its main rains in the winter, is comparatively poor in native grass-species. The vegetation here is mainly woody and grasses form only a minor part of the plant cover. It is in this region that the introduced annuals have proved such successful colonists. Between the Northern and South-Western Provinces is an exceedingly large intermediate zone known as the Eremean Province, a region with a very irregular rainfall. The grasses are mainly xeromorphic types, and include in the northern portion large areas of species of

* Flora of Western Australia, Vol. 1, Gramineae, by C. A. Gardner, pp. 400 + xii, 1 map, 1 coloured and 102 black and white plates and 6 diagrams. March 1952. Price 45/-. Government Printer, Perth.

Triodia—grasses with rigid spiny leaves, and in the southern part, smaller tufted grasses in open woodland and mulga bush.

This volume of the Flora should be available for consultation in the libraries of all institutions where grasses and grasslands form the subject for study. The second volume of the Flora will be devoted to an account of the species of *Eucalyptus*, an important genus in Western Australia, whilst the remainder of the work, much of which is in manuscript form, will fill about four volumes.

C. E. HUBBARD.

The Prince of Botanists.*—Few lives can have been fuller and more crowded than that of Carl Linnaeus. Born at the beginning of the eighteenth century, his love for nature was such that he ignored the conventional and, making his own investigations, truthfully recorded things seen with his own eyes, and his observations continue to be invaluable even to the present day. Much has been written of this remarkable man and the present book so aptly entitled "The Prince of Botanists" is the result of further extensive research. It is a general biographical account, chronologically arranged, in which the author traces in detail the life of Linnaeus from 1707, the date of his birth, to 1778, the year of his death. Chapters are devoted to his student days at Lund and Uppsala, his journey to Lapland, his visits to England and France, and the Gotland expedition. Reference is made to him as Professor and Rector magnificus of the Royal Swedish Scientific Academy, and to some aspects of his home life between 1751 and 1769. The work is fully documented, contains some of Linnaeus's drawings in the text and a number of photographic illustrations.

This extremely interesting biography ends with three appendices; the first refers to the acquisition of the Linnean collections and the foundation of the Linnean Society of London. The second deals with the historical background and the third gives a list of the works consulted and the abbreviations used. The book is well written and forms a notable contribution to our knowledge of this celebrated Swedish botanist.

H. S. MARSHALL.

The Hidden Life of Flowers.†—This attractive booklet, at a reasonable price, is essentially a collection of photographs depicting various phases of the reproductive process of a number of flowering plants. The photographs in photogravure, are mostly enlargements with the magnification given and are excellent examples of how the camera can record, and even elucidate, details of plant structure and behaviour. The series of pictures illustrating the life history of the poppy from flower bud stage to that of seed dispersal is particularly satisfactory.

The text is translated from the French of J. M. Guilcher and the original photographs were by R. H. Noailles.

It is to be hoped that this small book will have a sufficiently wide sale to justify more productions with photographic illustrations of this standard.

W. B. TURRILL.

* *The Prince of Botanists*: Carl Linnaeus. By Norah Gourlie. Pp. xiii + 292, illus. London: H. F. & G. Witherby Ltd. Price 30/-.

† *The Hidden Life of Flowers*, Andrew Melrose, London 1954, 5/-.

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